WORLD PETROLEUM REPORT 1960

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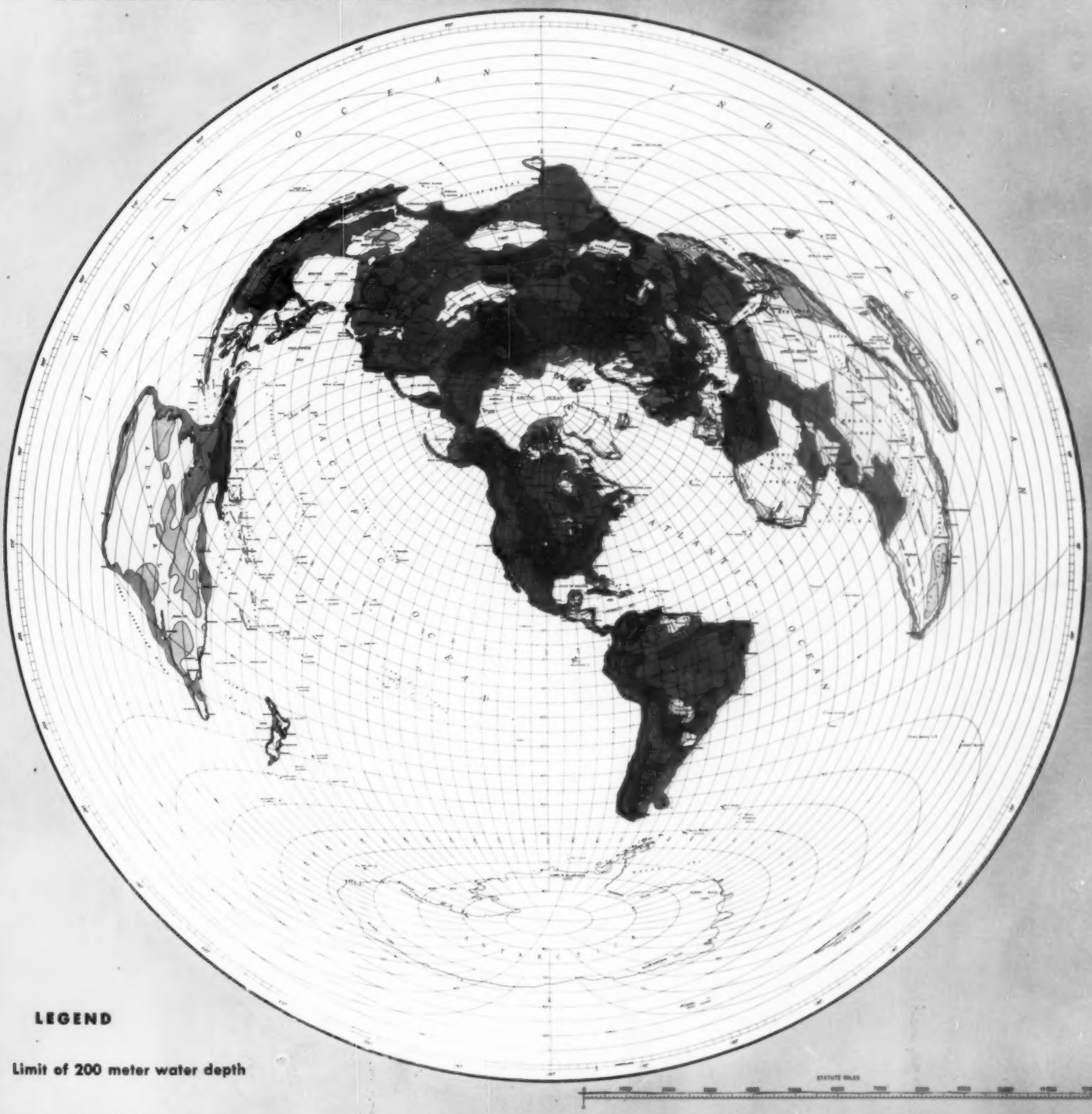
SEDIMENTARY BASINS AND OIL PRODUCING AREAS OF THE WORLD

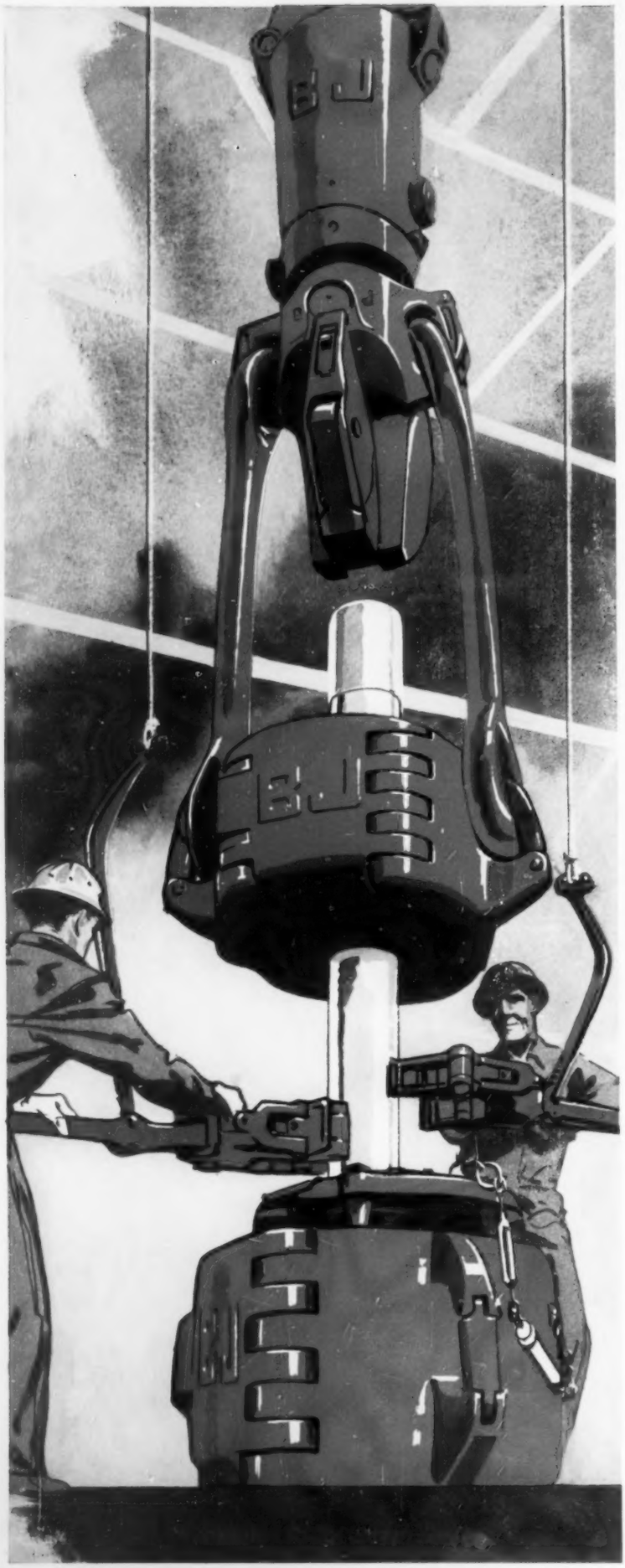


LEGEND

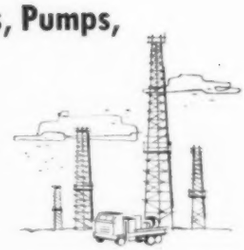
- Limit of 200 meter water depth
- Sedimentary Basins
- Oil and Gas Producing Areas
- Countries now producing oil
- Non-producing areas where exploration is underway

A straight line from the center of the United States (see star) gives the correct distance and direction to any other world point on this map measured on the accompanying scale of statute miles.

(Azimuthal Equi-Distant Projection by Geo. F. Kelly, P.O. Box 1773, Tulsa, Oklahoma)



With Tools, Services, Pumps, Field Stations, and Power Transmission Products . . .



BORG-WARNER SERVES THE OIL INDUSTRY

The oil industry today is a far cry from what it was just a few short years ago. New and improved techniques and equipment speed the work, save time, cut costs all along the line from drilling to production to processing.

Contributing to this dynamic progress are dozens of Borg-Warner products and services.

From our Byron Jackson Tools, for example, come hooks, spiders and elevators, tongs and slips, scratchers and centralizers, swabs, pipe wipers and other tools.

For cementing, acidizing, fracturing, perforating, and wire line service, Borg-Warner's BJ Service provides fast, efficient, dependable service from more than 50 conveniently located field stations.

To take the terrific shock loads of power transmission on drilling and pumping rigs, B-W's Morse Chain produces exceptionally rugged High Endurance roller chain, silent chain, Hy-Vo and Timing belts; and Rockford Clutch Division produces power take-offs and heavy duty clutches specially designed for oil field applications.

In pipeline service, and at the refinery, too, you'll find our Byron Jackson pumps performing all kinds of specialized pumping jobs.

Back of all these and other products is the Borg-Warner tradition of finest quality. And our constant research promises still better products and services for the oil industry in the years ahead.

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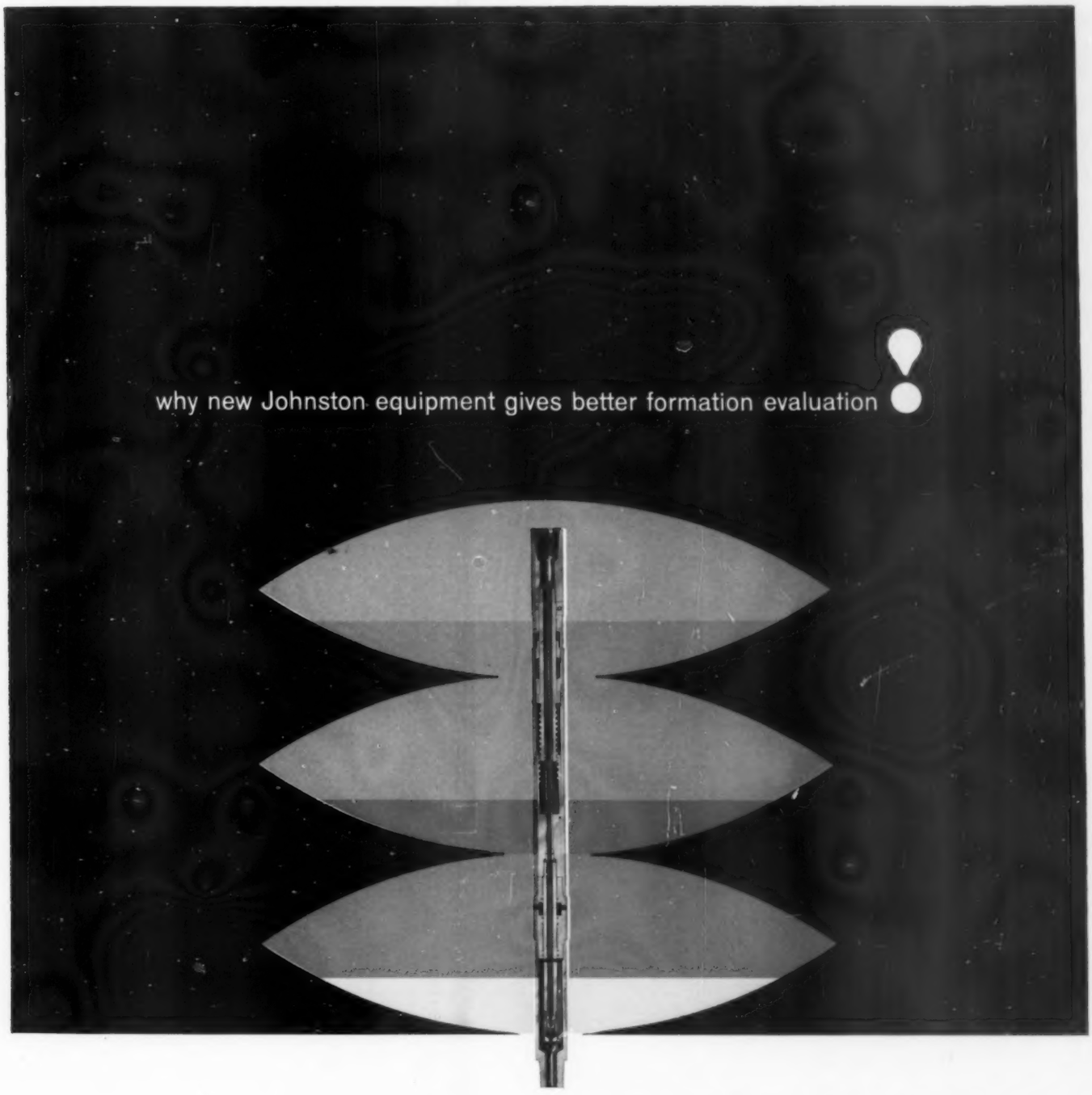

Johnston Testers, the most experienced in Drill Stem Testing, now offers a completely new line of testing tools. **Accurate/** Increased accuracy and positive action provide more dependable data ... no extra tests necessary ... formation facts the first time. **Dependable/** No equipment failures ... fewer misruns ... less maintenance ... tools are rugged, yet precision sensitive for each operational requirement. **Fast/** New Johnston tools perform tests faster ... shorter testing period ... less rig time ... tools work easy ... less expense! See the new Composite Catalog, or order the 1960 Johnston Catalog now. You get more from your Drill Stem Tests with new Johnston equipment. Post Office Box 98, Houston 1, Texas.

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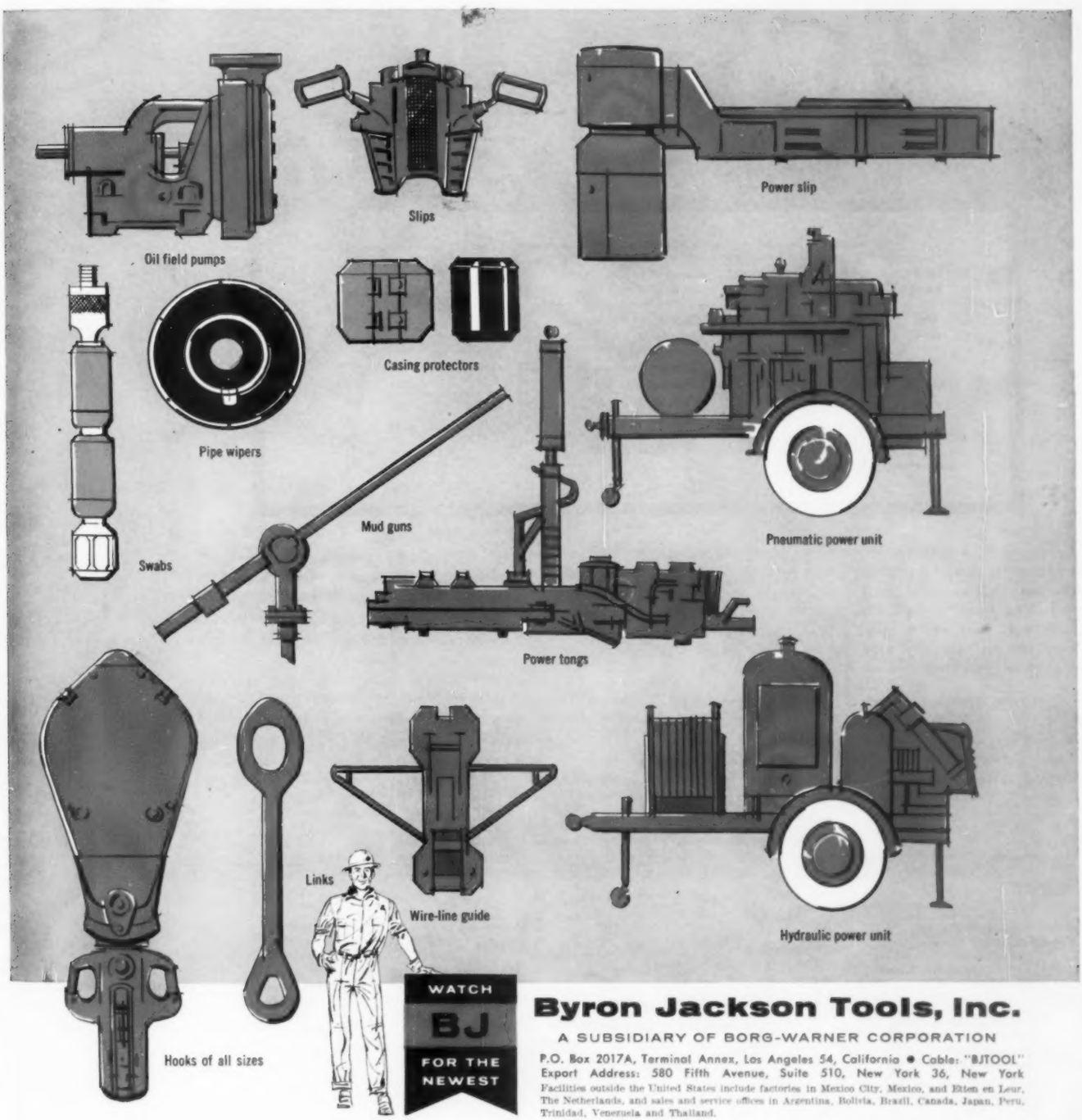


Byron Jackson Tools, Inc.

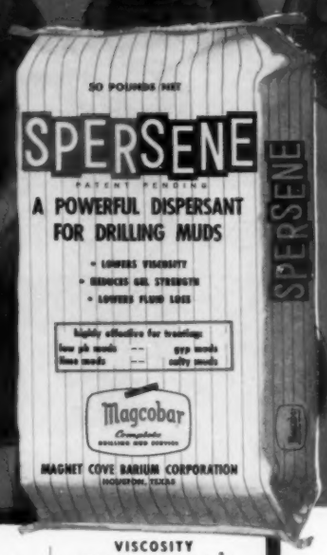
A SUBSIDIARY OF BORG-WARNER CORPORATION

P.O. Box 2017A, Terminal Annex, Los Angeles 54, California ● Cable: "BJTOOL"
Export Address: 580 Fifth Avenue, Suite 510, New York 36, New York

Facilities outside the United States include factories in Mexico City, Mexico, and Etten en Leur, The Netherlands, and sales and service offices in Argentina, Bolivia, Brazil, Canada, Japan, Peru, Trinidad, Venezuela and Thailand.

Now SPERSENE

Magcobar's *new* all-purpose dispersant cuts costs *in any kind of mud*



	Amount (pounds)	MATERIALS	Average Cost (Cents)	VISCOSITY (Yield Point-lb./100 ft.^{2})
gyp muds	1	Spersene	16.5	7
	1	Thinner A	18.5	14
lime muds	3.0	Spersene	49.5	6
	3.0	Thinner A	65.5	16
low pH muds	1	Spersene	16.5	8
	1	Thinner A	18.5	12
	2	Thinner B	20.0	20
	1	Thinner C	18.0	18
	1	Thinner D	17.0	31
sea water muds	4	Spersene	66	1
	4	Thinner A	74	3

Spersene®, a very versatile thinner, performs well in any mud. Its powerful thinning action combined with low cost make it a unique chemical for treating any drilling mud. You need no longer stockpile a number of dispersants at your well to meet different mud conditions. Now, you can simplify mud treatments with this new all-purpose dispersant and cut mud chemical costs, too.

Spersene costs less when you buy it; cost much less when you use it. As the tables show, Spersene lowers viscosity more effectively, at less cost, than any of today's leading thinners. This means a lower cost per barrel with Spersene. When projected to well volume, it means surprising savings. Whether you are using high or low pH mud, gyp mud, lime mud, or seawater or brackish mud, laboratory tests prove that Spersene is more efficient on basis of costs than any other dispersant. *Spersene is also effective in reducing viscosity and gel strengths in salty and saturated salt muds.*

Spersene is one more specific Magcobar solution to the problem of high drilling costs, one more development from the Magcobar laboratories that will increase your profit through more economical drilling.

Write for the new bulletin on Spersene.

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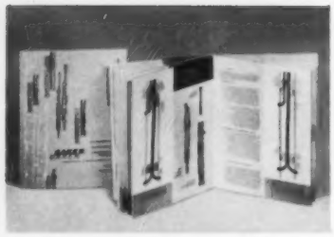

THE FACTS ABOUT MULTIPLE COMPLETION

Yours for the asking is Baker's Multiple Completion Guide, pictured above. It's a 24-page booklet of important engineering facts. In it are 13 of the latest and most practical hookups—dual zone, triple zone, quadruple zone. Write to Baker Oil Tools, Inc,. P.O. Box 2274, Terminal Annex, Los Angeles 54, California.

*9 Modern Production Packers

These are

Packer Accessories? Baker offers a complete line that makes the packers more usable and adaptable. Dual and triple string flow tubes, for instance, and plugs and other accessories.

BAKER MODEL "D" RETAINER PRODUCTION PACKER

Product No. 415-D

The most widely used drillable packer in the world. Contains continuous sealing bore and flapper-type back-pressure valve.

BAKER MODEL "DA" RETAINER PRODUCTION PACKER

Product No. 415-DA

Direct variation of Model "D" with a larger I.D. sealing bore located in the upper end of the packer. Permits larger bore through packer accessories. Used as an upper packer in two-packer flowing or pumping, parallel string hookups.

Single-Zone? Multiple-Zone? Water-Flooding? Deep Wells? Shallow? High Temperatures? Formidable Pressures? ■ The nine packers pictured here handle an impressive array of tough and simple production jobs.

* If you count the pictures, you come to number 9. But that's certainly not the total of packers made by Baker. For instance, Models "J" & "K" Snap-Set Packers are also made in double-grip versions. Model "E" is also offered with integral one-shot unloader, or with unloader and hold-down. Moreover, thanks to Baker's continuing program of packer research and development, new packers that will supplement the packers pictured above are coming.

Drillable

BAKER MODEL "F" RETAINER PRODUCTION PACKER
Product No. 415-F
Related design to Model "D". Contains larger continuous bore than Model "D" Used where extra large bore is required in some parallel (triple) string, flowing or pumping hookups.

BAKER MODEL "FA" RETAINER PRODUCTION PACKER
Product No. 415-FA
Related to the Model "F" Packer in the same manner that the Model "DA" is to Model "D". Contains extra large upper sealing bore. Provides largest I.D. of any retainer-type packer. Used in multiple string hookups exclusively.

These are Retrievable

BAKER MODELS "J" AND "K" SNAP-SET DUAL PACKERS
Used as the upper retrievable packers in two or three-packer, parallel-string installations. Provides largest full-opening bores possible. For instance, 7" size has full opening for two 2⅜" tubing strings. Actuated by set-down weight only, and can be set and released as many times as required. Short string can be run and retrieved separately. Model "J" is long-string set; Model "K" is short-string set. Also available are Double-Grip versions that contain built-in, button-type, hydraulic hold-downs.

(left)
Model "J" Single-Grip Snap-Set Dual Packer
Product No. 756-J

(right)
Model "K" Single-Grip Snap-Set Dual Packer
Product No. 756-K

BAKER MODEL "M" SNAP-SET PACKERS
Product No. 635-M
Used as the upper retrievable packer in two-packer, full-opening, selective cross-over, tubing and annulus production hookups. Set with set-down weight. Released and recocked for repeat setting by picking up on tubing.

BAKER MODEL "A" RETRIEVABLE TENSION PACKER
Product No. 739-A
One of the shortest, most modern high-performance tension packers. Ideal for economical, low- or high-pressure water flooding. Rugged enough for many high-pressure fracturing and acidizing operations. Simple J-Slot setting mechanism.

BAKER MODEL "E" RETRIEVABLE CASING PACKER
Product No. 420-E
One of the shortest, most compact, set down retrievable packers available. Ideal for light or medium duty production requirements, or for all-around water flooding use. Simple J-Slot setting mechanism.

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Baker packers don't go into the field alone. One of the great domestic oilfield service organizations stands behind them. Parts are always available, and so is service. So is the latest practical knowledge of how to use packers and how to set them.

BAKER

Fig. 3466 Horizontal Triplex Plunger Pump. Maximum speed, 250 RPM. Maximum capacities and pressures: 91 barrels per hour at 1180 PSI; 179 barrels per hour at 600 PSI.

THAT'S WHY WE'VE ADOPTED THEM AS STANDARD

We experimented a long time—and found, when the returns were in, that we got more of what we want in Gaso Pumps. More in adaptability to various conditions. More in day-in and day-out dependable performance. More in operating and maintenance economy, and more in service life. That, in a nutshell, is why we wrote GASO into our standard pump specifications, and why we consider the policy a short cut to the results we want in pumping service.

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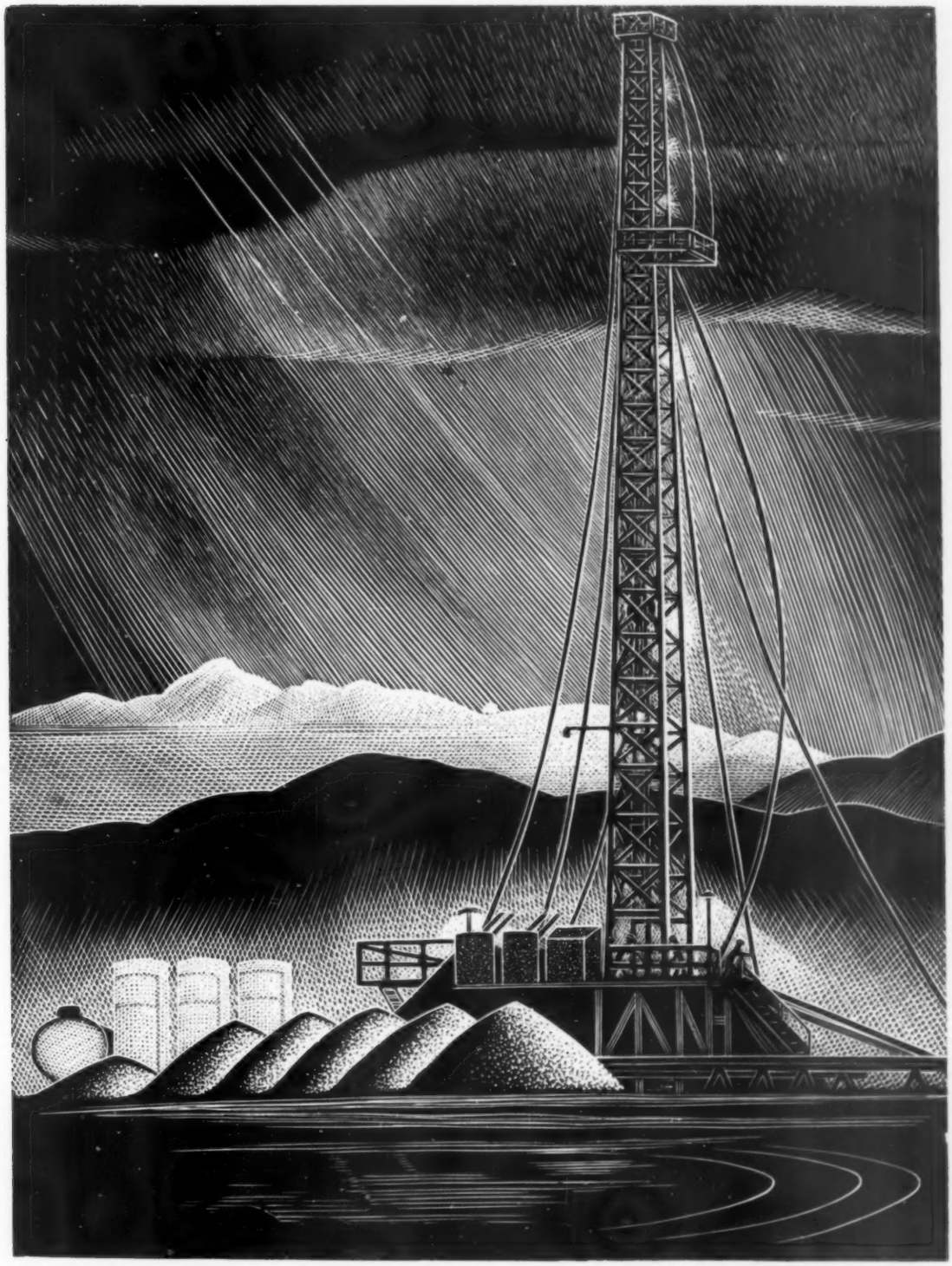

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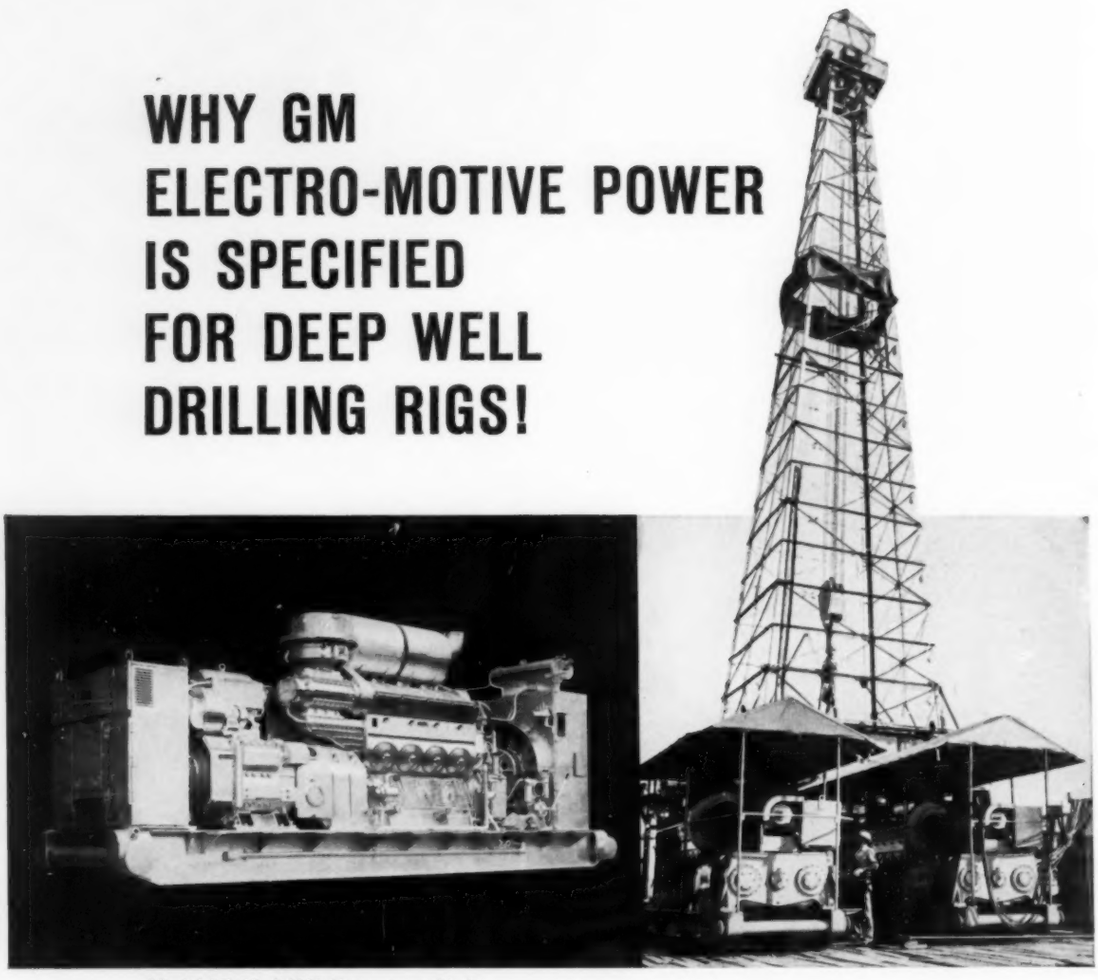

Model SR-10-A 1000 Horsepower Unit

MAKES HOLE FASTER—GM Electro-Motive Diesel-Electric Power reduces drilling time—and *costs!*

FLEXIBLE—Electric cables between generating units and drive motors are flexible, permitting fast transport, quick rig-up and complete freedom of power arrangement.

SIMPLE, ACCURATE CONTROL SYSTEM—Provides smooth and rapid acceleration of loads with positive control of speed and torque.

MATCHED COMPONENTS—GM Electro-Motive Power components were designed and built to work together—one manufacturer, one source of responsibility.

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Less than 15 years ago, the first package of modern detergent was sold to a dubious housewife. Today, two-thirds of the nation's cleaning is done by synthetic detergents.

This has been made possible by a chemical ingredient found in petroleum. Standard pioneered production of this substance and today produces more than half of all that is used in the United States.*

As every woman knows, synthetics do any cleaning job better. They make water "wetter," have greater cleaning power, cause dirt to come out fast and float away.

Detergents work in hard or cold water, leave no scum or bathtub ring, allow dishes to drain sparkling dry.

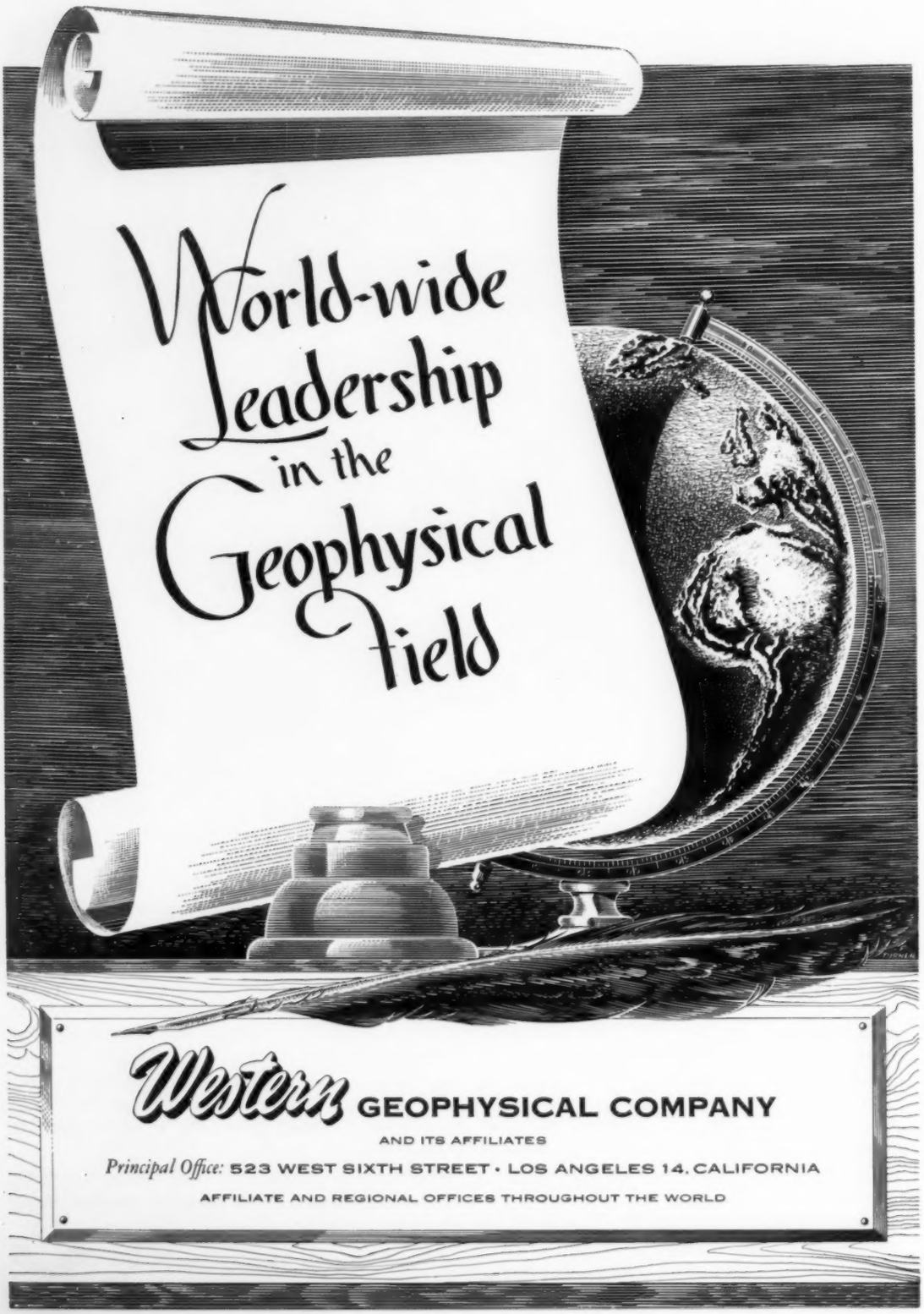
To make them even better, our scientists are continually testing new formulas, which they try out on stacks of dishes, bundles of scientifically soiled laundry samples, piles of dirty white shirts.

As a result, the detergents you use get better every year. And they become useful in more and more ways, from washing railroad cars to making water wetter for fighting fires.

In this way, by continually working to bring you better products, ***the people at Standard are planning ahead to serve you better.***

**through our wholly-owned subsidiary, Oronite Chemical Company*

STANDARD OIL COMPANY OF CALIFORNIA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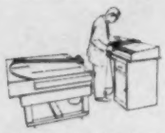
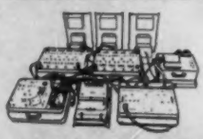


Data Plotting for More Realistic Data Presentation

Management with World-Wide Experience and Background for Reliable Results



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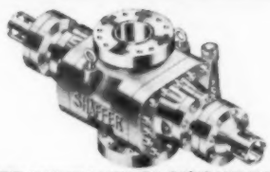
4 Top Examples of Shaffer Leadership!

IN BLOWOUT PREVENTERS

Shaffer Blowout Preventers not only give you **quality without compromise** but also give you the industry's widest selection of control gates, each incorporating unique performance advantages found in no other make of equipment. This is why leading operators have made SHAFFER equipment their top choice for modern well control!

for Extra High Pressures!



SHAFFER TYPE XHP BLOWOUT PREVENTERS

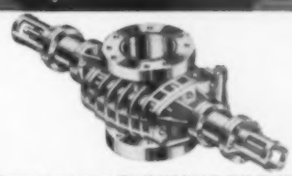
Three sizes are available in Type XHP Preventers . . . 7-1/16" bore size for *working* pressures to 15,000 PSI (tested to 22,500 PSI) . . . 9" and 11" bore sizes for *working* pressures to 10,000 PSI (tested to 15,000 PSI)

- **XHP Preventers feature "In-Line" ram and piston design, with no levers, yokes or other complicated connections between each ram and its operating piston. They are simple to install, positive in operation!**
- **XHP Preventers are also very easy to service. Their "Swinging End - Opening" design assures quick, simple ram changes without loss of operating fluid and without breaking hydraulic connections!**

These are typical of the many advancements that make XHP Preventers the finest available for *extra high* pressure protection.

For further details write for Bulletin No. 1000!

for "Quickie" Jobs!



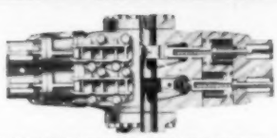
SHAFFER TYPE LWS BLOWOUT PREVENTERS

Lightweight and easy to move from rig-to-rig, LWS Preventers are ideal for quick "in-and-out" production and re-work jobs where time is a particularly vital factor.

- **LWS Preventers can be operated by a portable hand pump that eliminates need for installing the usual hydraulic piping and accessory equipment. With this portable hand pump they can be opened or closed in 15 to 20 seconds. Or they can be opened or closed in as little as 2 to 7 seconds with a choice of hydraulic power units.**
- **LWS Preventers have all the latest Shaffer design features . . . "Swinging End-Opening" doors for changing rams without loss of hydraulic fluid . . . positive, simple "In-Line" ram and piston design for direct, foolproof operation of rams . . . and many other unique Shaffer advantages.**

Bulletin No. 1001 outlines many other Type LWS features. Write for it!

for General Drilling!



SHAFFER TYPE B AND TYPE E BLOWOUT PREVENTERS

Type B has *non*-rising locking shafts for maximum compactness . . . Type E has *rising* locking shafts for quick indication of ram position.

- **Both types feature the convenience of "Swinging Side-Opening" doors for easy ram changes without loss of hydraulic fluid . . . and positive "In-Line" ram and piston design that eliminates yokes, levers and other complicated assemblies.**

For general drilling operations the Shaffer Type B or Type E Preventers are unequalled in efficiency, safety and trouble-free simplicity.

The Shaffer General Catalog describes many other features. Send for it!

for Continuous Protection!

SHAFFER ROTATING BLOWOUT PREVENTERS AND STRIPPERS

As long as the drill string is in the hole, Shaffer Rotating Blowout Preventers and Strippers maintain continuous pressure control *automatically*. They adjust automatically to fit the varying diameters of drill pipe, couplings and tool joints, as well as the varying shapes of square, hexagon and octagon kellys. No special drill string equipment is required.

- **Furthermore the pressure-tight seal is maintained continuously whether the drill string is being raised or lowered, is rotating, or is stationary.**
- **These units are ideal for regular drilling, for drilling under pressure, for reverse circulation and for drilling with air or gas instead of mud.**

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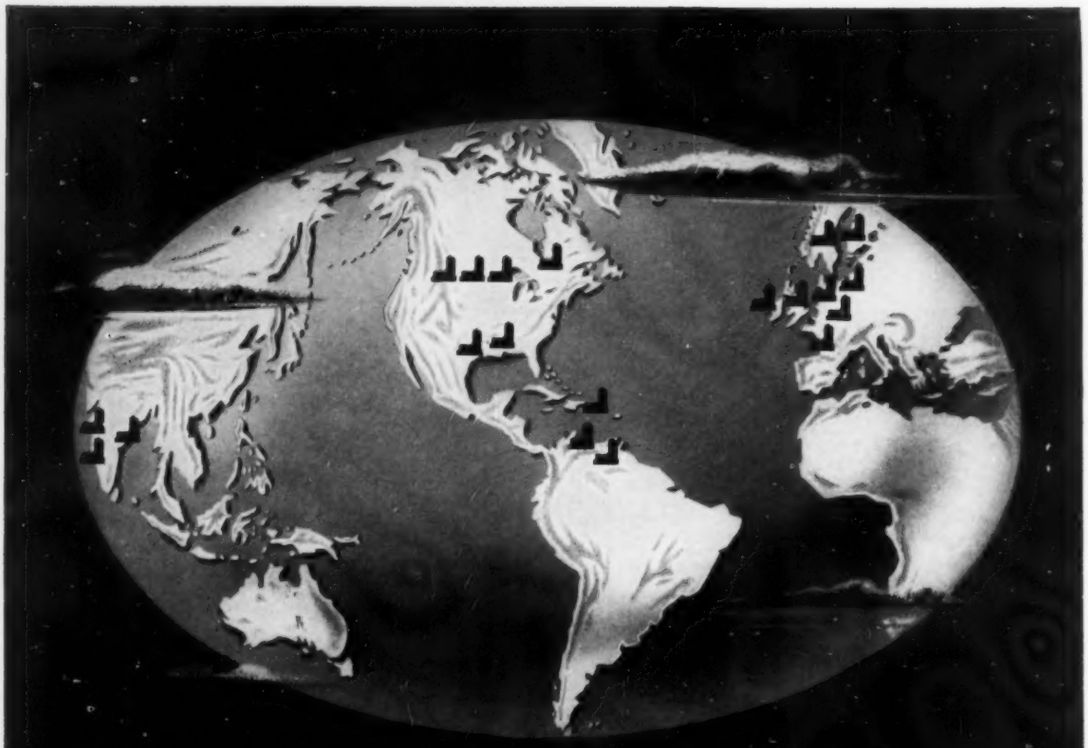

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WORLD PETROLEUM REPORT

AN ANNUAL REVIEW OF INTERNATIONAL OIL OPERATIONS

VOLUME VI—FEBRUARY 15, 1960

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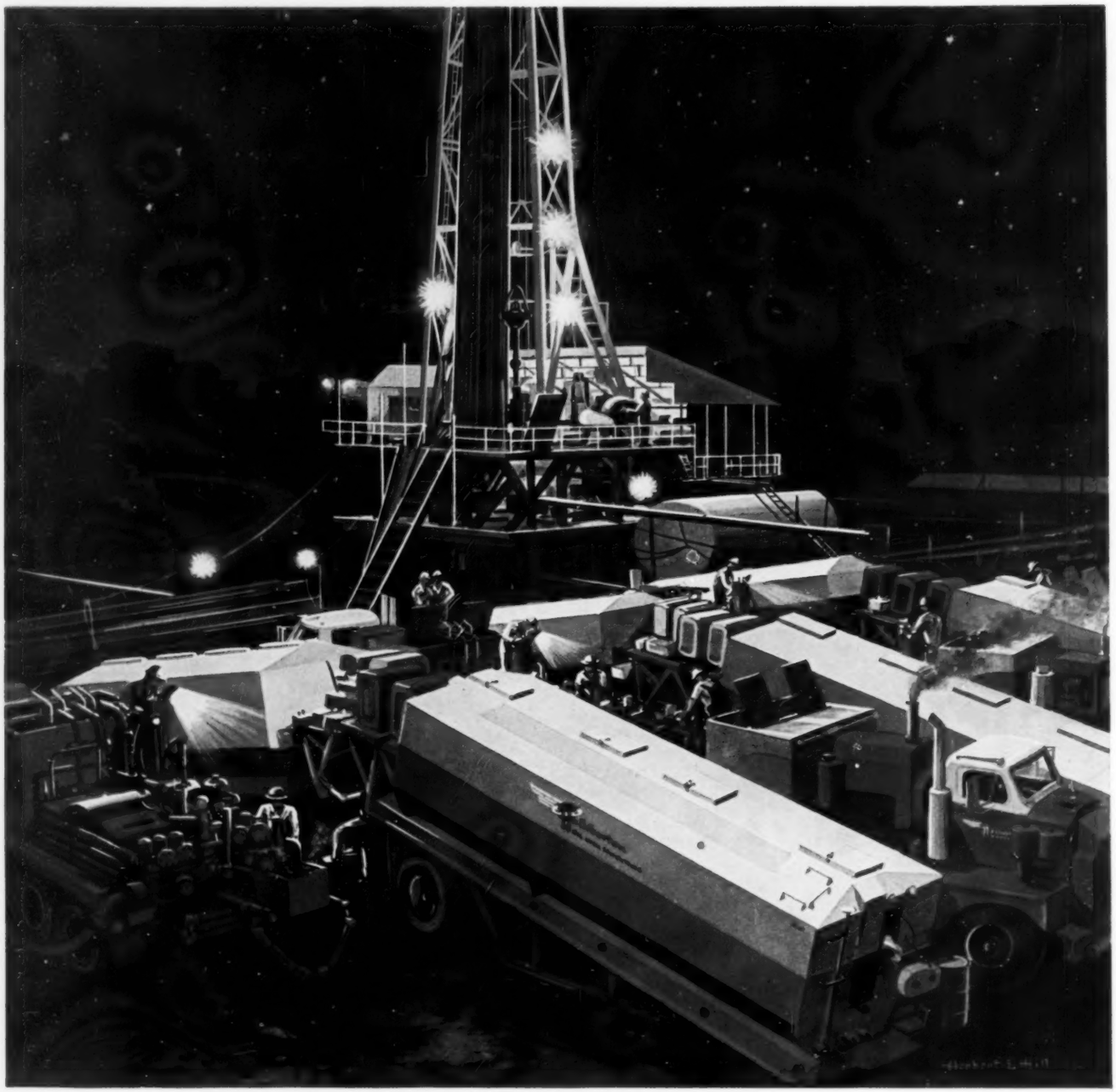

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WORLD

EXPLORATION: The world is undergoing the massive crude surplus predicted in the preface to *World Petroleum Report 1957*, but the excess seems hardly to have affected exploratory effort. Worldwide expansion in exploratory drilling occurred during 1959, and is predicted for 1960—both within the United States and outside. The same is not true of geophysical effort. Total world geophysical effort declined in 1959 due to a slackening in the USA effort. Final figures for the rest of the world are not in as yet, but indications are that outside the Western Hemisphere the rest of the noncommunist world again increased its party-months of geophysical activity.

The area of principal interest in 1959 was Africa. There a major exploratory effort is under way, principally in North Africa, but extending through many other prospective areas of the continent. Libya was the focal point, with discoveries there indicating a major area of reserves. Algeria brought forth no new major finds during the year, but there are already fields found to insure a high production level in coming years.

Oil discoveries were made during 1959 in France, Gabon, the Philippines, Argentina, and Trinidad (for reviews of these areas, see the respective sections). Canada and the United States had no discoveries of major importance. No oil finds of major importance are known to have been made during 1959 in Asia and Australasia with the exception of the discovery in the Philippines previously mentioned. However, the Far East has become steadily more conscious of its energy deficit, and exploratory effort is increasing.

During 1960 exploratory effort is likely to continue its concentration on North Africa, with shifting emphasis from Algeria to Libya and to the Spanish Sahara. Australasia will receive an increasing share, particularly Australia. The Middle East's offshore areas are particularly the focus of an intense effort, and during 1960 this effort will continue in an increasing tempo. Upon the results of drilling there will depend much of the world's crude surplus problem; for, if production is obtained by the companies which are drilling, it will be mostly in the hands of independent companies which do not have established international marketing facilities and which must find crude outlets soon.

PRODUCTION: World production of crude petroleum hit an all-time high during 1959, as it has done every year since the end of World War II. The rate of increase was about 6% during 1959 over the previous 1958 level. By way of contrast, world production in 1958 was only 2.5% above the 1957 level.

There is already substantial crude producibility at present which is not being used. The amount of shut-in production at the present time outside the communist bloc is estimated at 5.6 million barrels daily, approximately one-third present world production levels. Much of this, about 3.5 million barrels daily, is inside the United States and Canada.

By 1970 world demand for oil is expected to nearly double, reaching about 29.3 million barrels daily. Without deliberate wastage, there can be no production substantially above demand. For more detailed estimates of production levels, see the section on MARKETING, this report.

WORLD—Crude Oil and Liquid Gas Production, Reserves, Discoveries and Total Resources[a]

(As of January 1, 1959 in billions of barrels)

1	2		3		4		5		6	
Country or Area	Cumulative production	% of world	Proved reserves	% of world	Cumplative discoveries[b]	% of world	Ultimate resources[c]	% of world	1958 Prod. million bbl/day	% of world
United States	64.03	56.79	36.0	11.76	100.03	23.89	270.0	13.5	6.7	37.09
Balance N. America	4.33	3.84	5.0	1.63	9.33	2.22	110.0	5.5	0.72	3.99
Total N. America	68.36	60.63	41.0	13.39	109.36	26.11	380.0	19.0	7.42	41.08
South America	14.7	13.04	18.0	5.89	32.7	7.81	196.0	9.80	3.06	16.95
Total W. Hemisphere	83.06	73.67	59.0	19.28	142.06	33.92	576.0	28.80	10.48	58.03
Europe[d]	0.70	0.62	1.3	0.42	2.00	0.48	19.0	0.95	0.24	1.35
Africa[e]	0.02	0.02	8.0	2.62	8.02	1.91	100.0	5.00	0.03	0.16
Middle East[f]	12.83	11.38	200.0	65.38	212.83	50.82	780.0	39.00	4.32	23.92
Far East[g]	3.32	2.94	10.7	3.49	14.02	3.35	85.0	4.25	0.46	2.54
Total E. Hemisphere[d]	16.887	14.96	220.0	71.89	236.87	56.56	984.0	48.20	5.05	27.96
Total Free World	99.93	88.64	279.0	91.18	378.93	90.49	1560.0	78.00	15.53	85.99
Iron Curtain Countries	12.81	11.36	27.0	8.82	39.81	9.51	440.0	22.00	2.53	14.01
Total World	112.74	100.0	306.0	100.0	418.74	100.0	2000.0	100.0	18.06	100.0

[a] Includes both land and water areas.
[b] Column 2 plus column 3.
[c] Oil discovered to date (column 4) plus that estimated to be discovered in the future.
[d] Excluding the USSR and other Iron Curtain countries.
[e] Excluding Egypt.
[f] Including Egypt.
[g] Includes India, Pakistan, Burma, Japan, Indonesia, and other countries of Oceania, but not including China, Siberia, etc.

Source: Lewis G. Weeks, Petroleum Engineer, August 1959.

Reserves: Total estimated reserves for the world are given in an accompanying table. An increase of 5.6% occurred in 1959 over reserves at the end of 1958.

In *World Petroleum Report 1959*, p. 19, some estimates of ultimate reserves of the world were given. Since that time, another estimate has been made (M. Hubbert, Shell Oil Co.) placing ultimate crude reserves of the entire world at 1.25 trillion barrels. Of this, 910 billion barrels were designated as yet to be discovered. This compares with a world oil use at present of about 7.5 billion barrels per year.

TRANSPORTATION: The surplus of tankers continues, with intrusion of tankers into dry-cargo markets and their use for other purposes, such as electric generating plants for cities in Scandanavia. The tanker market is greatly overloaded, and surplus tonnage would probably exist in sufficient volume to depress tanker rates for two to three more years at least, even if the pastwar rate of growth were resumed.

WORLD—Estimated Refinery Throughput by Major Areas

(Thousands of Barrels Per Day)

	1958	1957	% Change
United States	7,606	7,919	— 4.0
Cuba & Mexico	317	349	— 0.9
Canada	661	655	+ 0.9
South America and Caribbean	2,144	2,062	+ 4.0
WESTERN HEMISPHERE	10,728	10,985	— 2.3
Western Europe	2,709	2,315	+17.0
Middle East	1,042	900	+15.8
Far East	917	870	+ 5.4
Other Countries (excl. communist)	84	135	—37.8
EASTERN HEMISPHERE	4,752	4,220	+12.6
WORLD	15,480	15,205	+ 1.8

The tanker market is likely to remain depressed for three principal reasons. First is the lessening impact of the Middle East. Whereas it would take roughly 27 T-2's to deliver 100,000 b/d to English Channel ports from the Caribbean, it would take 45 T-2's to deliver the same amount from the Persian Gulf. Therefore, the postwar growth of the Middle East as a supplier had an accelerating effect on tanker construction. Other factors include a possible major Arab line to the Mediterranean, or construction of a pipeline from western Canada to Montreal; new supply sources coming in nearer crude markets such as in Argentina, Brazil, and especially North Africa; and the import restrictions now in force in the United States. To this list can be added increased Russian exports, if any.

REFINING: The refining capacity of the world continued to grow at a rapid rate. Figures indicate a 1959 increase over 1958 of 1,186,460 b/d, or about 5.7%. It should be emphasized

(*Continued on page 24*)

World Functional Division of Major Petroleum Data — Year 1959

(In U.S.A. Barrels Per Day)

Country	Production	Refining: No. of Plants	Refining: Crude Capacity (As of July 15, 1959)	Refining: Cracking Capacity	Consumption (Crude-Equivalent Basis): 1959	Consumption (Crude-Equivalent Basis): 1960 (Estimate, Major Countries On'ly)	Proved Reserves (Millions of Barrels)
Aden	0	1	100,000	—	93,200	95,000	—
Albania	11,000	3	4,000	—	N.A.	N.A.	N.A.
Algeria (Incl. OCRS)	21,600	—	—	—	36,000	—	5,000
Angola	900	1	2,600	—	3,700	—	25
Argentina	130,100	16	213,600	96,900 TC	280,500	316,000	3,000
Australia	Nil	7	239,500	57,500 C	214,600	224,000	—
Austria	45,300	9	44,300	10,800 T	49,600	53,000	333
Bahrain	45,133	1	214,000	39,000 TC	29,200	—	220
Belgium & Luxembourg	0	7	155,200	22,600 C	142,600	151,000	—
Bolivia	8,700	4	11,800	—	7,200	—	95
Brazil	63,194	8	166,800	24,000 TC	250,800	272,000	610
British Borneo	112,000	1	44,000	—	N.A.	—	300
Bulgaria	4,900	1	5,000	—	N.A.	—	20
Burma	9,200	2	4,500	—	8,800	—	45
Canada	500,800	40	878,000	377,000 TC	825,400	862,000	3,600
Chile	17,600	2	44,700	16,500 TC	46,500	51,000	65
China (Communist)	80,000	N.A.	50,000	—	N.A.	N.A.	1,400
Colombia	145,000	5	70,300	41,000 C	59,300	62,000	750
Cuba	515	6	85,200	22,600 TC	81,600	85,000	6
Czechoslovakia	2,700	4	51,000	—	N.A.	N.A.	13
Denmark	0	2	600	3,300 T	90,600	96,000	—
Ecuador	8,000	2	13,800	6,000 T	11,000	—	24
Egypt	58,780	3	77,500	5,300 T	95,800	100,000	500
Finland	0	1	19,200	6,000 C	37,000	41,000	—
France	30,100	14	708,300	132,000 TC	526,800	566,000	200
Gabon (and Middle Congo)	14,500	—	—	—	N.A.	N.A.	37
Germany (West)	99,000	25	527,500	83,500 TC	554,900	640,000	500
Germany (East)	140	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Greece	0	1	27,000	—	40,900	—	—
Hawaii (incl. Alaska)	650	1	3,000	—	N.A.	N.A.	—
Hungary	19,500	5	34,000	—	N.A.	N.A.	200
India	9,000	4	110,000	29,400 TC	147,200	158,000	300
Indonesia	338,000	6	259,800	64,000 TC	90,000	—	9,000
Iran	850,980	4	485,200	27,000 C	122,100	131,000	35,000
Iraq	823,040	6	58,700	4,200 T	38,800	—	25,000
Ireland	0	1	20,000	—	26,900	—	—
Israel	2,500	1	84,000	18,000 T	37,300	—	40
Italy (and Sicily)	30,000	37	799,200	59,000 TC	361,700	395,000	300
Japan	7,600	23	552,950	48,300 TC	363,000	394,000	29
Kuwait	1,394,000	2	201,000	—	67,000	70,000	58,000
Lebanon	0	1	23,200	—	16,500	—	—
Libya	Nil	—	—	—	3,600	—	N.A.
Mexico	266,400	8	361,000	83,000 TC	309,900	327,000	2,500
Morocco	1,900	1	2,400	3,500 C	20,200	—	8,500
Netherlands	33,000	2	354,400	97,800 TC	207,000	221,000	200
Netherlands West Indies	0	2	650,000	306,000 TC	140,700	142,000	—
New Guinea	4,400	—	—	—	N.A.	N.A.	N.A.
New Zealand	Nil	—	—	—	37,200	39,000	Nil
Neutral Zone	114,700	1	50,000	—	N.A.	N.A.	13,500
Nigeria	11,000	—	—	—	N.A.	N.A.	80
Norway	0	1	2,000	—	66,700	70,000	—
Pakistan	5,900	1	5,000	—	42,000	—	25
Peru	48,500	3	47,500	14,500 T	47,400	—	326
Philippines	0	1	22,000	5,400 C	52,500	55,000	—
Poland	3,600	5	15,000	—	N.A.	N.A.	25
Portugal & Islands	0	2	81,200	12,700 TC	34,200	—	—
Puerto Rico	0	2	83,000	30,800 C	37,500	—	—
Qatar	172,100	1	600	—	1,300	—	2,500
Romania	255,400	11	240,000	—	N.A.	N.A.	1,000
Saudi Arabia	1,095,399	1	219,000	—	59,200	65,000	36,700
South Africa	0	1	23,000	10,000 C	100,600	105,000	—
Spain	0	2	134,100	—	107,200	112,000	—
Sweden	0	4	53,200	900 T	217,700	232,000	—
Switzerland	0	2	1,350	—	71,500	80,000	—
Syria	N.A.	1	10,000	—	16,000	19,000	105
Taiwan (Formosa)	Nil	1	21,000	14,000 TC	17,000	—	500
Thailand (Siam)	200	1	1,000	—	N.A.	N.A.	N.A.
Trinidad & Tobago	112,040	3	142,000	37,500 TC	44,000	—	425
Turkey	7,360	1	6,300	2,000 C	37,000	—	70
United Kingdom	1,700	14	892,400	124,000 TC	847,500	899,000	6
USSR	2,544,000	70	1,950,000	600,000 TC	2,625,000	—	29,000
United States	7,050,000	293	9,803,750*	6,678,000 TC	9,483,000	9,852,000	33,500
Uruguay	0	1	28,000	2,200 T	29,300	—	—
Venezuela	2,771,000	10	882,700	66,500 TC	165,000	171,000	18,000
Yugoslavia	10,100	3	22,700	6,400 TC	24,200	—	40
Total World	19,393,131	706	22,494,050	9,289,100	20,354,000	21,592,000	291,614

* As of Sept. 30, 1959.

PRODUCTION: Tabulation includes all countries which have any significant production of crude petroleum. Figures given in U.S. barrels of 42 gallons, for conversion to total barrels, multiply by 365. For rough conversion to total metric tons produced during the entire year, multiply by 50. Those countries which do not show any production did not produce oil in 1958, they are included only because they have refining facilities.

RESERVES: Figures are for proved reserves, as of January 1, 1959; or as close thereto as possible. For exact dating of reserve figure, see the appropriate country section. Figures are in millions of U.S. barrels of 42 gallons. For approximate reserve figure in millions of metric tons, divide by 7.5. It should be kept in mind that these figures represent proved reserves of oil in place, of which less than half are recoverable under present-day techniques and price levels.

REFINING: Refinery data were compiled in mid-1958 but corrected to year's end. For more details on plants, see the appropriate country section. USSR data are estimated, as are data on other communist nations. Capacities given are in barrels per calender day. Under Cracking Capacity to indicate type: T—Thermal, C—Catalytic. For persons not familiar with refinery processes, the crude capacity represents the amount of crude which can be run through the refinery; the cracking capacity should not be added to it to obtain total capacity.

CONSUMPTION: Note that consumption figures do not total up because **not all** countries of the world are included separately in the list, only the major oil users or those that have production or refining facilities. The World Total for oil use, however, includes **all** countries of the world, plus military liftings for the world as a whole, and represents entire world use. As concerns the use of crude equivalent, it is a device used to most closely represent the total use of crude petroleum. The same system is used for all countries to arrive at their crude equivalent figure, but different countries require different applications of it. For example, in the case of a country which has no refining, the crude-equivalent figure is imports of products with no change (except, to put the figures on the same basis for processing by IBM machine, the marketing allowance is added and subtracted after processing). In the case of a country having internal refining, the crude-equivalent figure is actual consumption as derived from sales reports, to which is added 7% of refinery runs consumed within the country. This 7% allowance is for refinery losses, etc. In addition, the sales figure is increased by 1% for all products except fuel-oil sales, and by 8% for fuel-oil sales. This is a marketing allowance for losses during sales. The world total, generally speaking, on a crude equivalent basis is 7% higher than actual consumption of products, since practically all products must be refined before they are consumed. NA—Not available.

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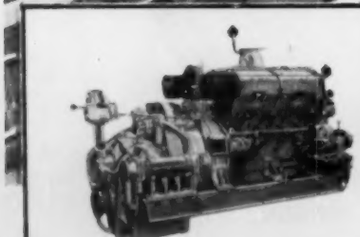

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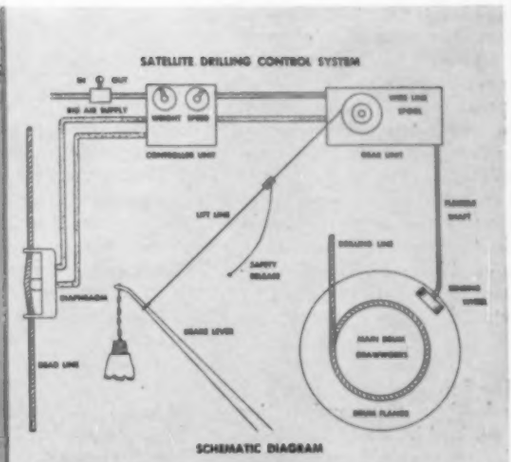

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that the most recent figures include what are regarded as somewhat more accurate data on capacities in the communist countries. Therefore, the percentage change should be regarded as an approximation. The share of total world capacity in the USA has held fairly constant over the past two years, at about 44%.

Refinery crude runs to stills in the world outside the communist orbit amounted to approximately 15.5 million barrels daily in 1958, compared with 15.2 million in 1957, an increase of only 1.8%. Major areas of increase were in the Eastern Hemisphere; in the Western Hemisphere, only South American and Caribbean countries showed a good increase. The distribution of the estimated refinery throughputs by major areas is detailed in an accompanying table.

MARKETING: The principal determinate of oil activity is the level of consumption. For various reasons, as outlined in *World Petroleum Report 1958*, p. 27, noncommunist demand has been held down since 1956, and during 1959 the increase was far below the postwar growth rate through 1956 of around 9% to 10%.

During the coming decades, world oil demand is estimated to continue its substantial growth, and the cost of supplying this amount of oil will rise commensurately. For a forecast of these expenditures, see *World Petroleum Report 1959*, p. 25. Estimates there show the staggering total of $78 billion total expenditure for all industry branches during the 1963-67 period.

A long-range look at world energy use was taken by Lewis G. Weeks, former chief geologist of Standard Oil Co. (New Jersey) recently. He foresaw a total world demand for energy in the year 2059 of at least 40 and probably 50 or more times that of 1959, approximately doubling every 20 years. He foresaw the enormous total of 5.5 *trillion* barrels of oil and gas used in that period, including secondary-recovery oil and tar sands. For further estimates by Mr. Weeks, see the accompanying tables. He also foresees the oil industry eventually becoming in large measure a chemical industry, and the extension of energy sources to direct utilization of sunlight and similar future resources.

Other estimates have been made, including those given in several papers delivered at the Fifth World Petroleum Congress such as those by Nathaniel B. Guyol of Standard Oil Co. of California. He foresees an increase in world energy needs of 127% between 1955 and 1975, with oil requirements increasing 187% during the period, and natural-gas use rising threefold as well. A paper by Walter J. Levy estimated world oil demand at 41 million barrels daily by 1975, a yearly increase of about 5.6%, somewhat lower than the Guyol estimate.

Narrowing the range of estimates to the next 10 years, an estimate has been made by Shell International Petroleum Co. Ltd. which foresees an annual increase of 5% through 1970, with world oil use rising to 30 million barrels daily in 1970, or 1.8 times as much as was consumed in 1958. A slightly faster rate of increase is predicted for North America, particularly now that dieselization of railroads is complete. Western Europe is considered likely to slacken its rate of growth. Latin America likewise is moving into a period of slower acceleration from its postwar rate of 8% yearly. Africa will also slow its rate of increase. In the Middle East, demand is growing faster than in any other area, but remains relatively small. In Asia, a steady increase in growth of energy use would indicate a steady increase in oil use, especially in India where energy consumption has been accelerating since 1952. Australasia, also, is estimated to increase steadily, at a slightly higher rate than that obtained in the 1950-58 period.

In the shorter term, the duration of the present world crude surplus is of immediate interest, and estimates vary widely as to its probable duration. The steady increase in oil discoveries has widened the worldwide ratio of crude reserves to annual production to about 43 to 1 at present from about 20 to 1 before World War II. Producibility in the noncommunist sphere is up to about 22.5 million barrels daily compared with about 2 million barrels daily in 1953.

Estimates of how long this situation of excess producibility would last have varied widely, but recently estimates have narrowed down to about three years. The change (previous estimates were as high as 10 years) is due to a growing awareness of the tremendous amounts of oil needed to supply just the incremental growth in demand, which every year increases oil use by about 1.2 million barrels daily.

Even supposing that producibility should grow by one million barrels daily in the next three years (to 1962), the period of crude surplus would be reduced at the end of that period to

WORLD—Supply and Demand Forecast, 1959-2059

100 YEARS OF SUPPLIES	United States	World	100 YEARS OF DEMAND	United States		World
Oil (primary)	216 billion barrels	1,900	1959-79	280		960
Oil (secondary)	190 billion barrels	1,500	1979-99	580	(in terms of	2,370
Natural gas	1000 trillion cubic feet	6,000	99-2019	1200	billion barrels	5,200
Oil shale	2000 billion barrels	12,000	2019-39	2480	of oil)	11,500
Coal	2000 billion tons	7,000	2039-59	5080		24,000

Source: Lewis G. Weeks, Petroleum Engineer, August 1959.

WORLD—Current Production, Estimated Potential Supplies, and a Forecast of the Next 100 Years Demand for Energy

(All figures are in terms of billions of barrels of oil)

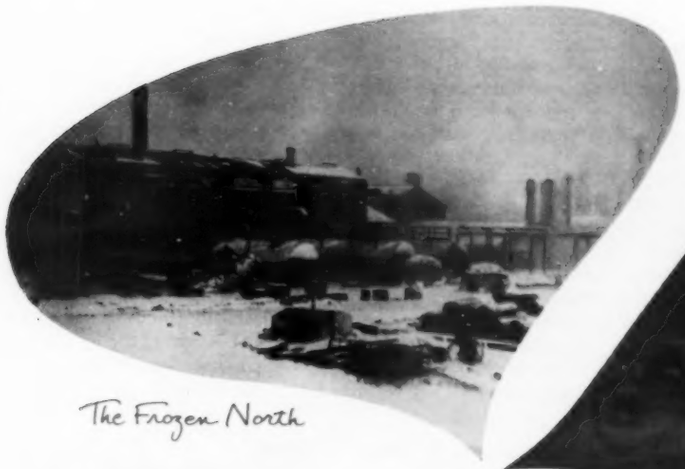
A. United States

1		2			3		4		
1958 Production		Potential energy supplies from limited sources			Years supply of energy source at 1958 rate of petroleum production		100 Years Demand[d] At 20-year intervals		By 20-year intervals
Oil 2.4 Gas 2.1	4.5	Conventional ultimate oil production	270				1959	9.0	14 x 20= 280
Coal	4.0[a]	Oil produced	64				1979	19.0	29 x 20= 580
Wood, water power etc.	0.5	Oil remaining	216		48		1999	40.0	60 x 20= 1,200
TOTAL	9.0	Secondary oil	190		42		2019	85.0	124 x 20= 2,480
		Tar sands	10		2		2039	176.0	254 x 20= 5,080
		Gas	164	570	33	127	2059	360.0	
		Oil from states	2,000		444				Total 9,620
		Oil equiv. of coal	16,000[b]		3,555				
		Oil equiv. of wood, water power, etc.[c]	50		11				
		Total	18,620		4,135				

B. World

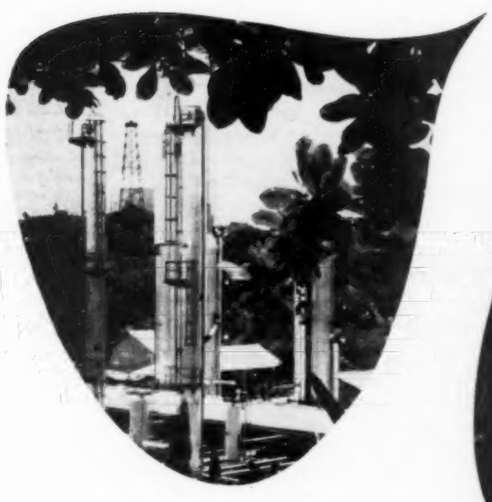
		Conventional ultimate oil production	2,000						
Oil 6.6 Gas 2.5	9.1	Oil produced	100						
Coal	20.5[a]	Oil remaining	1,900		209		1959	34.0	48 x 20= 960
Wood, farm wastes, water power, etc.	5.0	Secondary oil	1,500		165		1979	75.0	118.5 x 20= 2,370
TOTAL	34.6	Tar sands	1,100		121		1999	170.0	260 x 20= 5,200
		Petroleum gas	1,000	5,500	110	604	2019	380.0	575 x 20=11,500
		Oil from shales	12,000		1,538		2039	820.0	1200 x 20=24,000
		Oil equiv. of coal	55,000[b]		6,044		2059	1,730.0	Total 44,030
		Oil equiv. of wood, farm wastes, water power, etc[c]	500		55				
		Total	73,000		8,241				

[a] One ton of coal plus hydrogen is taken as equivalent to 8bbl of oil.
[b] Taken as equivalent to 2,000 billion tons of coal for the USA and 6,875 billion tons for the world.
[c] Estimted total for the period 1960-2059 only.
[d] Based on the assumption that demand will increase 40-fold in 100 years for the USA and 50-fold in the same period for the world.
Source: Lewis G. Weeks, Petroleum Engineer, August 1959.



The Frozen North

The Sunny Mediterranean



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around 14%. This is based on an increase of 3½% to 4% in USA oil demand, with the rest of the noncommunist world increasing to 9% yearly from 6½%.

OIL LAWS

For a discussion of the major legal systems governing oil development and production throughout the world, see *World Petroleum Report 1957*, p. 16. There are four principal systems, including the distinctive type of regulation found in Canada and the United States: the nationalized oil system as found in Mexico, Brazil, Chile, or the communist countries; the concession system found widely in the Middle East and some other countries such as North Africa; and, finally, the regulation of oil exploration and production by means of a single petroleum law (sometimes contained as part of the general mining laws). These are discussed in detail in the issue referred to above, and there is little to add to that here except to amend the statement that Egypt's 25% royalty had been the highest in the world; it was surpassed in 1959 by Cuba's 60% royalty.

During 1959, significant revisions in oil laws were made in Alaska, Spain, Greece, Nigeria, Pakistan, Syria, India, the Sudan, and Cuba. All these were major changes in existing legislation. All constituted inducements to international investment, except Cuba's new legislation and Syria's.

At the end of 1959, bills of major import were pending in Colombia, where the proposed law would substantially raise the costs of exploration; in Saudi Arabia, where a long-standing oil law was complete but still had not been passed by the Council of Ministers; in Panama, where a modernization of existing laws was under study by the congress; Trinidad, where another modernization and a 50-50 profits split were under consideration; Bolivia, where a very restrictive new oil code was before the congress but probably would not receive approval; Italy, where relaxation of the present law had some lukewarm support; Afghanistan, where a new law had been awaiting the king's approval for many months; Canada, where revisions in existing legislation are awaiting approval to stimulate exploration in the Far North; and Burma, where a bill of long standing is awaiting approval.

New concession or drilling agreements of interest include the Ethiopian concession of Elwerath Co. (Germany); many new agreements in Australia; Jersey Standard and Mobil Oil's OCRS (Algeria) agreements; the new CORI (ENI) concession in Libya; the Tennessee, Southeastern, and AGIP drilling contracts in Argentina; the acquisition of exploratory rights by Brazilian companies in Bolivia; and the rush for concessions in the Spanish Sahara. These do not complete the list by any means. Many other countries have experienced leasing activity, as for instance the Philippines and Egypt. END

APPARENT DEMAND REFINED PRODUCTS (U. S. BUREAU OF MINES)

(Barrels Daily)

Country or Area	1957	1958	Percent Increase
Canada	637,440	662,170	3.9
Costa Rica	3,040	3,520	15.8
Cuba	72,300	60,950	−15.7
Dominican Repub.	6,360	6,600	3.8
El Salvador	3,470	4,590	32.3
Guatemala	6,590	7,840	19.0
Haiti	1,980	1,920	−3.0
Honduras, Brit.	270	250	−7.4
Jamaica	11,820	12,320	4.2
Mexico	223,070	233,860	0.4
Nicaragua	3,050	3,050	0
Panama Canal Zone	22,970	14,800	−35.6
Panama	5,560	6,520	17.3
Puerto Rico	35,860	30,550	−14.8
Trinidad	38,280	42,810	11.8
USA (Incl. Alaska & Haw.)	7,466,380	7,587,690	1.6
NO. AMER. & CARIBB.	8,538,440	8,679,440	1.7
Argentina	234,820	238,870	1.7
Bolivia	6,060	5,650	−6.7
Brazil	193,000	214,380	11.1
Chile	38,670	38,260	−1.1
Colombia	44,820	46,830	4.5
Ecuador	8,360	8,400	0.5
Neth. Antilles		156,960[1]	
Paraguay	1,560	1,610	3.2
Peru	41,150	41,620	1.1
Uruguay	28,770	25,670	−10.8
Venezuela	140,180	127,420	−9.1
SO. AMERICA	739,720[2]	905,670[3]	1.2[3]
Austria	36,270	39,590	9.2
Belgium & Luxem.	115,180	123,470	7.2
Denmark	72,480	87,440	20.6
Finland	35,340	27,810	−21.3
France	358,490	398,840	11.3
Germany, West	298,170	372,240	24.8
Greece	32,380	36,060	11.4
Iceland	6,630	6,520	−1.7
Ireland	20,470	21,010	2.6
Italy	238,220	280,230	17.6
Netherlands	144,150	157,620	9.3
Norway	61,820	62,370	0.9
Portugal	27,020	28,130	4.1
Spain	77,630	78,940	1.7
Sweden	174,650	190,620	9.1
Switzerland	54,900	63,310	15.1
United Kingdom	552,680	680,690	23.2
Yugoslavia[4]		20,660	
WESTERN EUROPE	2,306,570	2,675,550	16.0
Aden		66,930	
Bahrain	15,380	17,970	16.8
Iran		77,430	
Iraq	28,850	33,130	14.8
Israel	26,730	28,710	7.4
Jordan	2,740	3,450	25.9
Kuwait	37,470	52,650	40.5
Lebanon	13,400	12,340	−7.9
Neutral Zone		980	
Saudi Arabia	41,420	38,410	−7.3
Turkey	28,240	39,060	38.3
UAR, Syria	12,140	13,910	1.5
MIDDLE EAST	206,370	384,970[5]	16.1[5]
Burma	6,580	7,990	21.4
Cambodia & So. Vietnam	10,330	12,810	24.0
Ceylon	27,320	18,430	−32.5
India	115,620	118,910	2.8
Japan	289,580	323,440	11.7
Korea, South		13,540	
Malaya & Singapore	73,150	71,950	−1.6
Pakistan	36,990	39,380	6.5
Taiwan	12,470	14,150	13.5
Thailand	18,000	17,630	−2.1
ASIA	590,580[6]	638,230	8.1
Algeria	17,140	21,370	24.7
Angola	3,290	3,610	9.7
Belgian Congo	10,000	10,100	1.0
Canary Islands		17,990	
Ethiopia	1,920	2,310	20.3
States formerly in Fr. Equator. Africa	2,700	5,240	94.1
Fr. West Africa	42,730	28,860	−32.5
Ghana	7,480	7,830	4.7
Kenya	17,600	14,660	−16.7
Liberia	680	1,160	70.6
Madagascar	2,400	2,610	8.8
Morocco	13,180	13,660	3.6
Nigeria	10,770	12,050	1.2
Rhodesia & Nyasaland	9,580	10,220	6.7
Sudan	6,820	8,730	28.0
Tanganyika	5,010	4,960	−1.0
Tunisia	8,500	8,040	−5.4
Uganda	2,700	2,920	8.1
Union So. Africa	85,640	72,450	−15.4
UAR, EGYPT	71,420	75,150	5.9
AFRICA	319,560	323,920	1.4
Australia	173,550	179,710	3.5
British Borneo		11,220	
Indonesia	67,620	65,990	−2.4
New Caledonia	1,160	1,070	−7.8
New Zealand	34,990	34,430	−1.6
Philippines	41,500	40,550	−0.2
OCEANIA	318,820	332,970	4.4
WORLD TOTAL, excluding, USSR, East Europe & Mainland China	13,020,060	13,575,040[7]	4.3[7]

[1] Netherlands Antilles (not reported in 1957), influenced heavily by refinery fuel and losses, bunker loadings (incl. aviation bunkers), and stock changes.

[2] So. America total for 1957 includes Brit. Guiana, 2,330 b/d.

[3] So. America total for 1958 includes Neth. Antilles. Percent change based on total exclusive of Neth. Antilles, which is 748,710 b/d.

[4] Yugoslavia not reported for 1957.

[5] Middle East total for 1958 includes all countries. shown. Percent change based on total excluding Aden, Iran, and Neutral Zone, which is 239,630 b/d.

[6] Asia total for 1957 includes Afghanistan, 540 b/d.

[7] World total for 1958 and percent change includes all countries reported for both 1957 and 1958. If it included all countries shown for 1958, the 1958 world otal would be 13,940,750 b/d and percent change would be 7.1%.

CENTRAL AMERICA

EXPLORATION: No exploratory discoveries were made during 1959, with the exception of some offshore discoveries in Mexico near established producing areas. Exploration continues to increase, however, especially in Guatemala where encouraging shows have been found. For a map of oil possibilities see *WPR 1959*, p 131.

PRODUCTION, REFINING, MARKETING: Production in the area is primarily from Trinidad and Mexico. No production in five smaller republics of Central America has been established.

OIL LAWS

During 1959 changes in oil laws occurred in Panama, where a new oil law was promulgated and in Cuba where extremely restrictive legislation was passed. A new law is under consideration in Costa Rica. All the oil laws and their regulations have been translated and published in *"Central America and Caribbean—Basic Oil Laws and Concession Contracts,"* a very complete and accurate compilation which is unique in its field. It is available through *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

No significant changes in the various national factors affecting investment occurred during 1959. The Cuban revolt seems less likely to slow development than the adverse geological findings there.

BAHAMA ISLANDS

EXPLORATION: On April 6, 1959, the offshore well at Cay Sal by Bahamas California Oil Co. and Bahamas Gulf Oil Co. was plugged, and the rig towed away. The well, a world's depth record outside the United States and the record for offshore drilling anywhere in the world, went to 18,906 and was dry. Cost was about $3 million. It was drilled from a mobile platform in 30 ft of water. Location was latitude 23° 49′ 24″ N, longitude 80° 12′ 24″ W.

PRODUCTION, REFINING, MARKETING: There is no refining or production in the Bahamas. Marketing requirements are very small, supplied entirely by import. During early 1959 Royal Dutch/Shell formed a new subsidiary, Shell Co. of the Bahamas Ltd., to expand marketing operations.

OIL LAWS

The complete text of the oil laws has been published in an unusually accurate and complete compilation entitled *"Central America and Caribbean—Original Oil Laws and Concession Contracts."* It is available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

For a digest of the oil laws, see *WPR 1957*. For a briefer summary, see *WPR 1958*, p. 75.

NATIONAL FACTORS

The principal unusual factor is the complete absence of any taxation of income, dividends, shares, or property. Import duties are moderate. For a listing of these and other factors, including governmental stability, see *WPR 1957*. The principal unfavorable factor mentioned therein, the difficulty of profit remittances and capital transfers, has been largely eliminated by the recent convertibility of the pound. For companies with nonresident status, there is no barrier of any kind against transfer of profits and dividends, and many of these may be kept outside the exchange control entirely (thereby avoiding a very small stamp tax) by depositing them in USA banks to the credit of the Bahamian company.

The oil law, which is based on the 1938 model law from the British Colonial Office, is administered fairly and flexibly, according to companies which have worked there. Obligations are only general, but they are amplified by long "model licenses" which are supposed to be a basis for negotiation but actually make the law less flexible than similar jurisdictions, such as British Honduras.

BARBADOS

EXPLORATION: There have been a number of exploratory wells drilled, but no drilling is in progress now. Barbados Gulf Oil Co. abandoned its last well early in 1959 and pulled out the rig, moving it to British Honduras. It retains the licenses covering the entire island. Kerr-McGee Inc. has 25% interest.

PRODUCTION, REFINING, MARKETING: There is no production or refining. For marketing requirements, see accompanying table.

OIL LAWS

The oil laws of Barbados have been published in *"Central America—Basic Oil Laws and Concession Contracts,"* an unusually complete volume containing the original texts of all applicable laws. It is highly recommended, and may be obtained by writing to *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

On January 12, 1959, a new taxation law became effective, known as the Petroleum Winning Operations Taxation Act, 1958 (1958-43). It contains provisions for a 10% depletion allowance, among other things.

NATIONAL FACTORS

The various factors affecting oil investment are favorable, including governmental stability, workable tax and oil legislation, and others.

HONDURAS

EXPLORATION: No exploration is known to have occurred during 1959. Some drilling has been done (see *World Petroleum*, April issue, p. 77, and *WPR 1957* and *1958*), but without discovery. The two companies exploring (see map) plan exploratory tests. Petroleos Hondurenos plans a test on a surface structure about 26 km west of the town of Santa Barbara near Atima. Cia. Petrolera Hondureña plans a test about 30 km west of the town of Comayagua. For ownership of these companies (both are American) see *WPR 1958*.

PRODUCTION, REFINING, MARKETING: There is no production of crude. A 15,000 b/d refinery, the country's first, was proposed by by International Industries Inc. in late 1958. The government requested it be built in the Gulf of Fonseca area. Duty protection would be provided by the government. Its construction has been postponed due to lack of government approval, however.

Marketing requirements are very low, estimated at slightly over 3,400 b/d.

NATIONAL FACTORS

There has been little change in the various national factors listed in previous editions, especially those outlined in *WPR 1957*. Taxes remain low on income the unit of currency, the lempira, remains at 49.5 US cents; and investment history is good.

President Ramon Villeda Morales signed an extensive labor code during June 1959 which raises fringe benefits substantially, although not basic wages (which range from $1 to $3 per day). Up to 8 months of sick pay are provided for employees with 8 years of employment. Vacation time is extended to 20 days a year. A social-security law is to follow.

Politically, the country is still under the grip of General Andino, who is 84 years old and has been in power since 1923. He has given his consent to modernization of the Honduran Nationalist party under Jorge Fidel Duron, a lawyer and diplomat. The ruling Liberal party leans to the left. It elected 36 deputies to the constituent assembly in the 1957 elections, compared with 18 by the Nationalist party.

BRITISH HONDURAS

EXPLORATION: Until recently British Hondural Gulf Oil Co. was the principal explorer. Later joined by Shell, the company has drilled nine dry exploratory wells and has no wells drilling at present. On October 20, 1958, half the country's area was converted to oil mining leases; the remainder was surrendered. Bandini Petroleum Co., an independent from Los Angeles, Calif., formed Belize Petroleum Co. Ltd. to hold prospecting licenses and a working agreement with West Caribbean Oil Co. (a subsidiary of Moriqui Exploration Co., another California independent). The holdings of Bandini and Moriqui companies were farmed out to Phillips Petroleum Co.

The leases held by Gulf have 30-year durations. The oil prospecting licenses held by the West Caribbean Oil Co. were granted in June 1958, and run for two years. The oil prospecting licenses held by Belize Petroleum Co. were granted in June 1958. Two of them will run for two years, and two will run for four years.

Phillips has drilled two wells, both in the south near Punta Gorda. Punta Gorda No. 1 well, three miles northwest of Punta Gorda, was abandoned on June 30, 1959, at 10,750 ft. Machaca No. 1 was abandoned six miles northwest of Punta Gorda.

The new Sinclair-BP combine took 9,000 square miles in its first Western Hemisphere licenses in British Honduras following an announcement by the government that applications would be accepted for licenses over 5,600 square miles. The minimum requirements are maintenance of a drilling rig in continuous operation for each 1,000 square miles or fraction thereof under license.

PRODUCTION, REFINING, MARKETING: There is no production or refining. All consumption is imported. See accompanying table for imports.

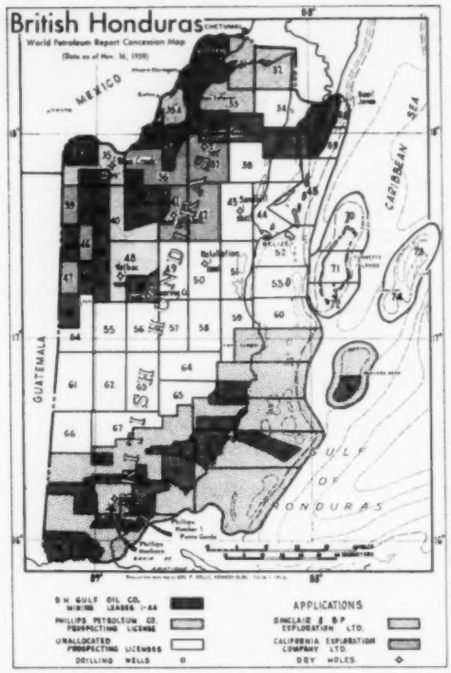
OIL LAWS

The oil laws of British Honduras have been published and are kept current in an interesting new publication, *"Central America and Caribbean—Basic Oil Laws and Concession Contracts."* It is available by writing to *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

Controlling Statutes: Governing statutes in British Honduras are as follows: No. 17 of 1937, The Petroleum (Production) Ordinance, 1937; No. 4. of 1939, An Ordinance to Amend the Petroleum (Production) Ordinance, 1937 (No. 17 of 1937) and to repeal the Oil Mines Ordinance—Chapter 86 of the Consolidated Laws, 1924; No. 12 of 1941, The Petroleum (Production) (Amendment) Ordinance, 1941; Statutory Instruments No. 56 of 1949, Oil Mining Regulations made by Governor in Council under Section 13 of the Petroleum (Production) Ordinance, 1937; Statutory Instrument No. 5 of 1958, Regulations made by the Governor in Council under Section 13 of the Petroleum (Production) Ordinance, 1937.

Model Leases include: Oil Mining Lease—Model Clauses (Crown and Alienated Lands); Oil Prospecting License (Crown and Alienated Lands) Model Clauses.

The only recent legislation is the Oil Mining (Amendment) Regulations, 1958. It changes annual exploitation surface taxes to range from British Honduras $.50 during the first year of the oil mining lease to BH $3.00 during the 10th and each subsequent year (35 US cents to US $2.10 approx.).



Some checkerboarding has been done in the Gulf and Phillips holdings in the extreme south which does not show on this map.

COSTA RICA

EXPLORATION: There is only one exploring company at present, the Cia. Petrolera de Costa Rica, subsidiary of Union Oil of California and, since 1958, owned 50% by Gulf Oil Corp. Drilling has been unsuccessful by the company so far. On July 3, 1959, the company abandoned Porvenir No. 1 well, 20 miles south of Limon, at 6,755 ft, after mechanical difficulties.

In October 1959, a well was spudded near the town of Pto. Limón. A second well, Tigre No. 1, is to be spudded north of Pto. Limón on the Río Reventazon, and a third, Telire No. 1, will be drilled in the south of Limón province, near the Panama border.

PRODUCTION, REFINING: None

OIL LAWS

The new oil law awaited for several years has never reached the congress, and will undoubtedly be a long time doing so.

EL SALVADOR

There is no exploration, production, nor refining in El Salvador. Delta Oil Co. (of the United States) made a study of oil possibilities during 1959, according to reports, but possibilities were found to be "less than encouraging."

The government approved in mid-1959 the contsruction of a large refinery by Esso, a subsidiary of Standard Oil Co. (New Jersey), near La Union seaport on the Pacific coast. The plant will be the first ever constructed in the country. It will operate on Venezuelan and Peruvian oil and, if it proves successful, the government has announced it will build a new and larger refinery nearby. Imports of oil during 1957 totaled 1,413,000 bbl, about 3,871 b/d, most of it gasoline, followed by fuel oil and kerosine.

OIL LAWS

There is no petroleum law. The Mining Code (not applicable to oil) of 1922, as amended by Decree 930 of January 21, 1953, provides for special legislative approval of petroleum contracts. Decree 106 of July 23, 1937, as amended by Decree 65 of September 30, 1940, and Decree 100 of December 20, 1941, provide for import exemptions for mining companies. A Mining Department was created by Decree 2326 of February 5, 1957. A new mining and oil law has been under consideration, but attempts to draft it have not been successful so far.

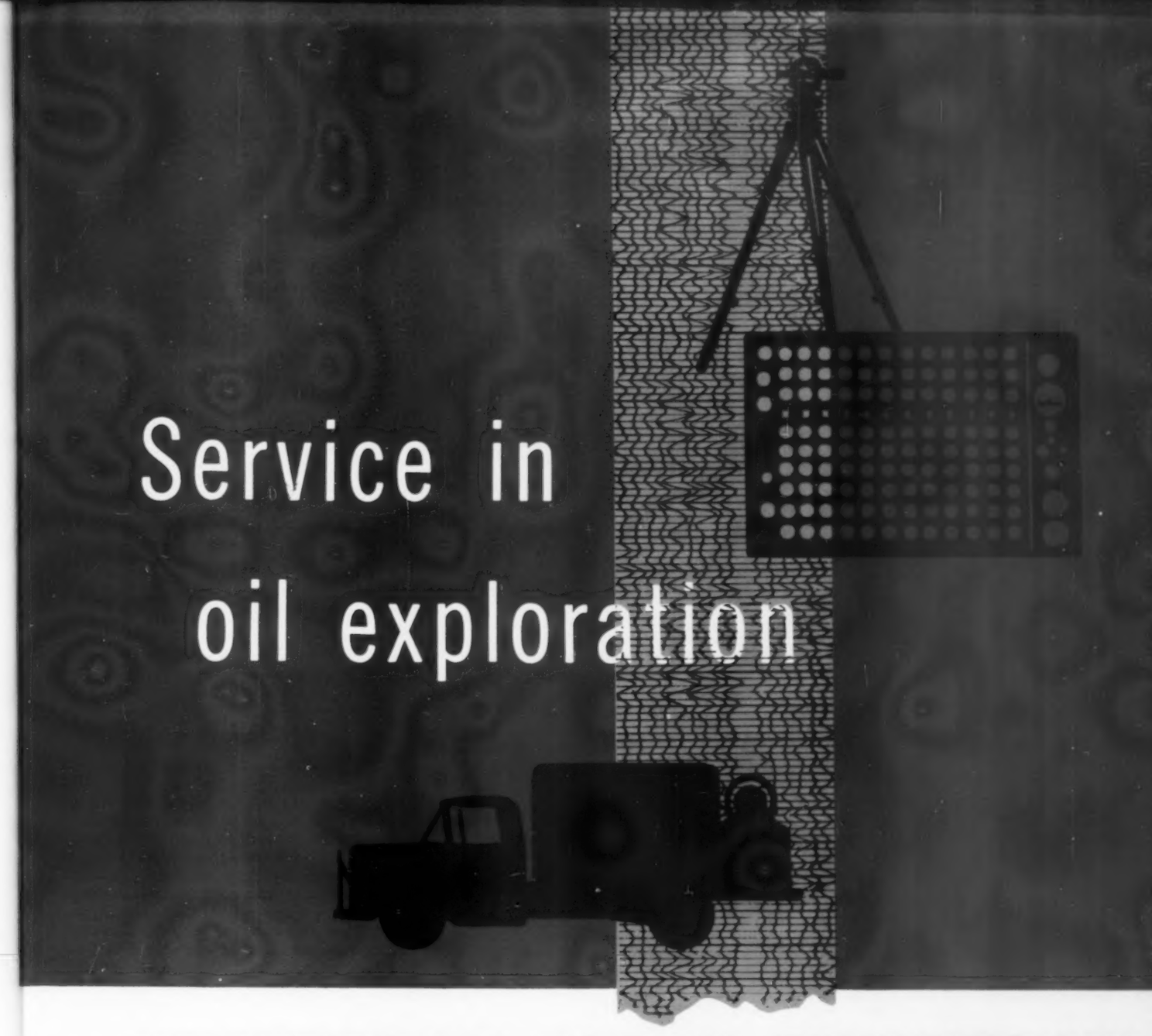
Oil marketing activities now are operated under concession contracts with the Ministry of Hacienda, and include tax exemption for necessary equipment along with free entry privileges.

Under the current (1950) constitution, El Salvador claims territorial waters extending seaward for 200 marine miles.

NETHERLANDS WEST INDIES

There is no exploration or production. The economic life of the islands of Curacao and Aruba, where Shell and Jersey Standard have their two large refineries (see *WPR 1957*), is dependent on the plants' operations.

The investment climate is good, and the government attitude very favorable. The government has launched a successful development program with inducements to investment. These inducements include a 10-year tax holiday, exemption from profits tax, no import duties, no restrictions on foreign ownership or foreign employment, and guarantees against expropriation or nationalization. A treaty with the USA eliminates double taxation. There is no exchange control, with the guilder a "hard currency" fixed at 1.885 per US dollar. The history of Lago's and Shell's relations with the government is long and peaceful.



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CUBA

The Cuban petroleum industry virtually has been brought to a standstill in the wake of the Castro revolution, and the future outlook appears bleak. A decree in October 1959 authorized seizure of all oil-company files and records concerning the exploration and exploitation of petroleum in Cuba; and almost confiscatory legislation approved in November 1959 cancels all requests for new concessions, with 60% royalty—the highest to date in any country—imposed on existing oil production. Quotas have been set which may pave the way for nationalization of oil refineries. A newly established Cuban Petroleum Institute has been given authority to carry out exploration, refining, transportation, distribution, and purchase and sale of oil products.

EXPLORATION: Even before the recent political crisis, the Cuban industry had been declining for some time. Lack of new oil finds, lowered exploration activity, slumping production, and relatively high movements of oil in and out of the country dominated the scene.

During 1959 no discoveries were made, and production in the eight small fields continued to decline.

PRODUCTION: Cuban crude-oil production dropped to 516 b/d in 1959, compared with 941 b/d in 1958. Natural-gasoline production in 1958 totaled 3,435 bbls. Crude production in 1958 was down 13% from the previous years, and in 1957 it was 37% under the record output of 1,485 b/d in 1955.

Cuba has no reserves in the proper term of reference. Probable total future production, based on present fields, is two to three million barrels.

REFINING: There are six refineries in Cuba with a combined crude capacity of 88,200 b/d—expected to rise to 103,200 b/d in 1961 and to remain at that level through 1963. In 1959, thermal cracking capacity accounted for 500 b/d and catalytic cracking for 22,000 b/d—10,600 b/d reforming, 1,000 poly, 10,500 b/d hydrogen processing; and there was 200 b/d of lube capacity.

A new plant began operating in 1958 at El Cotorro, the Refinería de Petroleo Santa María SA, with about 500 b/d capacity. A new $3 million 3,000 b/d refinery at Cienfuegos in Las Villas province was planned in 1958 to replace the 2,000 b/d plant at Cabaiguán in the same province; but construction has since been suspended at Cienfuegos. Instead, the Cabaiguán plant (which had been damaged by fire) is being rebuilt.

CUBA—Refineries
(As of Jan. 1, 1960)

Name of Company	Plant Location	Crude Capacity	Type of Plant	Cracking Capacity
Compania Petrolera (Shell)[1]	Havana	28,500	S	10,600C
Esso Standard Oil Co.[2]	Belot	36,500	SC	24,000C
Petrolera Jarahueca	Jarahueca	200	S	——
Refinadora Cabaiguan[3]	Cabaiguan	2,500	S	500T
Refineria Bacuranao	Bacuranao	500	S	——
The Texas Co.[4]	Santiago	20,000	S	3,000
		88,200		38,100

[1] 1,000 b/d gas-separating unit. [2] 2,600 b/d Powerforming, 2,400 Hydrofining, 1,300 b/d poly, 1,000 asphalt. [3] Cabaiguan plant to be replaced with 3,000 b/d (later 5,000 b/d) crude unit at Cienfuegos, Las Villas province, with 1,500 b/d catalytic reforming. [4] 3,300 b/d cat reforming, 4,000 Hydrotreating, 1,500 b/d Linde gasoline-treating unit, and 200 b/d LPGas unit. Key to type plant: S—skimming; C—cracking. Under cracking capacity to indicate type: C—catalytic; T—thermal.

Refineries in Cuba processed 88,400 b/d of crude in 1958; 59,200 b/d in 1957; 11,400 b/d in 1956; 10,000 b/d in 1955; and 9,000 b/d in 1955. Crude imports in 1958 totaled 25,755,400 bbl.

Consumption of oil products in Cuba during 1959 averaged 81,600 b/d. Oil-product imports (excluding crude) came to 4,392,300 bbl for the year 1958 (about 12,030 b/d), of which 2,584,600 bbl was fuel oil. Exports of oil products from Cuba during 1958 totaled 6,436,900 (about 17,608 b/d).

Cuban oil refiners have been forbidden to change prices on oil products without permission of the Ministry of Commerce or unless so decreed by the Cuban president (see Oil Laws hereinafter).

LPGas distributors may apply for official government registry. Included will be those eligible for duty-free LPGas imports. Entry of more LPGas into Cuba is being allowed in anticipation of lowered domestic output. Action followed the government's requirement for mixture of alcohol with gasoline at the rate of 15% to 18%.

OIL LAWS

Previous oil laws in Cuba had been favorable to international investors (see *WPR 1958* and *1957)*; however, the oil law which followed the revolution and the successful Castro coup almost completely stopped exploration. Law 608, published in Extraordinary Edition 49 of the *Official Gazette*, dated October 27, 1959, authorized seizure of all oil-company files and records concerning the exploration and exploitation of petroleum in Cuba.

This was followed by Law 635 of November 23, 1959. Its principal provisions have already been mentioned, it may be sufficient to say that it was completely unworkable for private operation.

The Castro government has ended the right of oil refiners to make automatic changes in their prices for oil in accord with changing costs. Instead, by Law No. 130, the government fixes prices for gasoline, kerosine, fuel oil, and other oil products by presidential decree or by resolution of the Ministry of Commerce.

NATIONAL FACTORS

The explosive political situation in Cuba probably will worsen before it improves. The severe new oil legislation, plus sentiment of the present government toward nationalization of key industries, is hardly calculated to encourage investors; and the oil companies face rough going. The decisive factor in the recent seizure of oil-company records is believed to be oil advisors from Mexico, who recommended the step. The government long has believed that the companies secretly found oil and refused to reveal it, and recently a high government official in Cuba stated this belief.

One company executive summed up his company's attitude by saying "I wish they had done it five years ago. They would have saved us a lot of money."

PUERTO RICO

EXPLORATION: Several concessions are held, including Ponce Oil Co., Maritime Oil Co., Allastair Frazer, and Cataract Mining Corp. R. L. Roger, a geologist, has concessions on the entire island of Mona, about 50 miles west of Puerto Rico. Maritime Oil Co. is drilling a 6,000-ft to 7,000-ft test on the south coast near the village of Santa Isabela, the first exploratory test to be drilled in Puerto Rico.

PRODUCTION, REFINING, MARKETING: There is no production of crude. There are two refineries and, because they are in a very favorable position and not subject to USA import restrictions, the government has agreed not to grant any more refinery permits.

Commonwealth Oil Refining Co. has enlarged its Guayanilla Bay refinery to 75,000 b/d. The island's second plant at San Juan, rated at 13,500 b/d, is operated by Caribbean Refining Co. Both plants operate on Venezuelan crude. Caribbean's plant includes 13,100 b/d fluid catalytic cracking capacity, with 9,000 vis-breaking and 500 polymerization capacity. The Commonwealth plant has 53,600 b/d catalytic cracking capacity, with 7,460 b/d reforming plus 40,300 b/d vis-breaking, a 1,400 b/d alkylation unit, and 2,370 b/d polymerization.

Socony Mobil has opened marketing outlets through independent marketers. Socony will later build its own service stations. Gulf Oil also has announced plans to enter the country's marketing.

OIL LAWS

The oil laws of Puerto Rico have been published in *"Central America and Caribbean—Basic Oil Laws and Concession Contracts (Original Texts)."* The volume is available through *Petroleum Legislation, Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

Puerto Rico is outside the USA federal tax area, and federal income tax does not apply. The local income tax is 20% maximum. The country is also inside the USA sphere, and production obtained would have free access to USA markets without tariff or import restrictions.

The governmental attitude is favorable, and substantial tax incentives are given to investors under "Operation Bootstrap," a program aimed at lifting the island's economy. Labor supply is plentiful, and wages low.

HAITI

EXPLORATION: During the 1944-47 period, eight wells were drilled: four by Atlantic Refining Co.; three by John Mecom; and one by Commonwealth Oil Co. (see map). All four were dry. New Industries of Haiti SA and Paul Burke, an American investor, reportedly have acquired exploration rights over 3,500 square miles in southern Haiti. The island of Gonaves is included. Burke has reported an asphalt discovery in southeastern Haiti. Reportedly, Haitex Oil Corp., of Wilmington, Del., has been granted two 40-year concessions for exclusive exploitation of oil, gas, and other hydrocarbons, according to Haitian official reports. The company is to pay the government 10% of the net value of the petroleum extracted in each case. One concession is near St. Michel de l'Attalaye, and the other in a zone north of latitude 19°20′, including the Ile de la Tortue.

Commonwealth Oil Co. drilled an exploratory well in Haiti which was abandoned in February of 1959. Location was due east of Port-au-Prince, about 30 km, and it was drilled to a total depth of 3,772 ft. There were no shows reported. The company does not have plans to drill another well as yet.

OIL LAWS

See *WPR 1957* for a résumé of the Mining Law and the Commonwealth concession. A concession has been reported to Charles Holliman, of Dallas, Texas, between latitudes of 18°30′ and 19°30′, granted July 31, 1958. Duration is 18 months. On discovery, 40% to the concessionaire, and 20% to the company in charge of the operation. None of these terms has been confirmed.

PRODUCTION, REFINING: None.

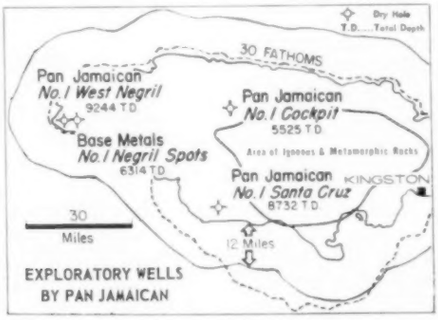
NATIONAL FACTORS

For a review of the factors influencing investment, see *WPR 1957*. Political instability has held back exploration, but the investment history is good.

JAMAICA

EXPLORATION: Oil prospecting licenses covering the entire island were returned by Pan-Jamaican Oil Co., after it had drilled four dry wells, to Base Metals Mining Corp. in 1958; and, at the end of 1958, they were surrendered by Base Metals. Time Petroleum, a Kansas company, has taken a 4-month option on exploration rights.

PRODUCTION, REFINING, MARKETING: There is no production. All marketing needs are imported. Plans to build a refinery by Jamaican Oil & Chemical Co. were dropped when Esso Standard Oil SA reached an agreement with Jamaica officials to set up a 26,000 b/d oil refinery. Esso is to provide products at no increase over present retail prices to the consumer, and prices are not to exceed prices of imported products. Esso is not to have monopoly rights.



OIL LAWS

The text of Jamaica's oil laws has been published in an unusual new set of volumes entitled *"Central America and Caribbean—Basic Oil Laws and Concession Contracts."* It is available through *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

Jamaica's oil laws have been summarized for *World Petroleum Report* by Samuel Hart of the leading Jamaican legal firm, Manron & Hart, of 17 Barry St., Kingston. The summary follows:

OIL LAW SUMMARY

Governing legislation is consolidated in the Petroleum (Production) Law (Chap. 292) of 1940, amended by Law 10 of 1955; Regulations of 1950, 1954, and 1955.

EXPLORATION: First stage covered by oil exploration license. **Minimum Area:** 8 square miles. No maximum. **License Fee:** £50 for every 1,000 square miles; maximum fee, £1,000. Licensee may obtain oil prospecting license; area not more than 200 square miles. Under oil prospecting license, **annual rent** during the initial term is 5 shillings, and each renewal 10 shillings for each square mile. **Royalty:** On crude, 4 shillings per long ton; on natural gas, two pence per thousand cubic feet sold. From royalties, rentals are deductible. **Surrender:** Any time on three months' notice. **Conversion:** Licensee has right to an oil mining lease not exceeding one-half the prospecting license area.

EXPLOITATION: Lease is granted only on area of former prospecting license. Applicant must make a topographic survey. **Area:** Maximum 100 square miles. **Yearly Rental:** In first, second, and third years, one shilling per acre—rising to six shillings in 10th and subsequent years. **Royalty:** On crude, maximum 12% of value, not less than two shillings and six pence per ton. On casinghead, maximum 10% of value up to two Imperial gallons per thousand cubic feet of gas treated. On gas, two pence per thousand cubic feet sold. Rent paid is deductible. Lease must contain clause for periodic revision of royalties.

NATIONAL FACTORS

The governmental attitude is favorable, and considerable encouragement is given new industries in the form of tax incentives, etc. The lack of energy sources limits economic development and improves the attitude toward oil investment. Income-tax minimum on corporations is 8 shillings ($1.12), or 40%, per Jamaican pound ($2.80) of the net or chargeable income. This includes the income tax of 7s. 6d. ($1.05) per pound, or 35%, plus a "company profits tax" of 5%.

There is a seven-year tax exemption on new industry, from the date of initial production, for foreign companies. Losses may be carried forward six years. International companies established in Jamaica which do not carry on trade in the British West Indies receive 100% tax relief. Depreciation allowances for machinery and equipment average 10% annually.

DOMINICAN REPUBLIC

EXPLORATION: Cia. Petrolera Dominicana acquired in 1956 rights over most of the country. It was formed by William D. Pauley, McLane Stewear, H. S. Cole Jr. & Son, and local capital. Holdings total about 1.6 million acres. H. S. Cole, Jr., Inc. took a farmout and drilled two wells in 1958; then withdrew. The wells drilled by H. S. Cole, Jr., Inc. were both dry. Licey No. 1-3 went to 12,020 ft in the Upper Cibao Valley near Licey Village. Villa Isabel No. 1-4 in the Lower Cibao Valley near Isabel went to a total depth of 10,881 ft. Cia. Azuana, an affiliate, drilled two shallow tests (160 ft to 190 ft) in two old oil fields and terminated its arrangement with Dominicana in 1959. No exploration is known to have been done in 1959, although Dominicana indicated work would continue.

PRODUCTION, REFINING, MARKETING: There is no production or refining. Marketing requirements are small; they totaled about 2,430,000 bbl in 1957.

OIL LAWS

The petroleum law is Law 4532 on Hydrocarbons. It is available in translation, and has been published by *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

MEXICO

EXPLORATION: 1958 Summary: Well completions in 1958 totaled 379, compared with 389 in 1957. Of the 1958 total, 76 were exploration (67 by Pemex and nine by private contractors). Results were seven gas wells, 10 oil, and 59 dry. Private firms accounted for one of the gas wells and eight of the dry holes. Some 303 were development wells—222 by Pemex and 81 by independent contractors. Results were 29 gas wells, 240 oil, 34 dry. Independent contractors brought in two of the gas and 70 oil wells and nine dry holes. Total exploratory and development wells showed 36 gas, 250 oil, 93 dry holes. Score for Pemex was 33 gas, 180 oil, 76 dry; for independent contractors three gas, 70 oil, 17 dry. Total depth of exploration wells was 188,568 meters and development wells 615,119 meters.

Two new gas fields were found during 1958 in the Eocene and Oligoçene trends of northeastern Mexico; one small oil field was found in the Poza Rica district, and a fourth oil field in central Tabasco in southern Mexico.

1959 Summary: Outstanding discovery during 1959 was Mexico's first offshore oil field by Pauley Pan American Petroleum Inc., with two wells in the Bay of Campeche ½ mile offshore from Coatzacoalcos, Veracruz.

The discovery well, 112 Rabon Grande, tested at a 772 b/d rate of 38 API oil from 8,692 ft and 912 b/d from 9,676 ft on a ¼-in. choke. Pauley Pan American will move in four more rigs to develop its promising new discovery. Two rigs will be barge-mounted, and two land-based, for slant drilling into the field one mile from shore. Pauley announced in August that the first stepout, 3,700 ft northeast of the Santa Ana discovery well, had been dually completed. It produced 2,340 b/d on test with a small choke —744 b/d from 5,720 ft, and 1,596 b/d from 8,031 ft. It was carried to 8,700 ft, encountering 10 producing sands, Pauley said.

Pemex' exploration program called for drilling 477 wells in 1959: 121 exploratory, 356 development—using 118 rigs.

PRODUCTION: During 1959 Mexico's crude production (not including condensate) averaged 262,403 b/d. Pemex has cooperated in making these figures available. During 1958 production was 93,512,000 bbl of crude for an average of 256,197 b/d. Condensate and absorption liquids totaled 7,129,000 bbl during the year. This compares with total crude runs to stills during 1958 of 95,310,000 bbl. Official figures for Mexican crude production, not including condensate, during 1959 are given in an accompanying table.

Reserves: Pemex chief Roldan stated, on March 18, 1959, that petroleum reserves, including the petroleum equivalent of gas, now total more than four billion barrels.

REFINING: Refineries are shown in an accompanying tabulation. Total crude capacity, as of mid-1959, was 361,000 b/d. Additions will raise the number of plants to nine, with a total capacity of 501,000 b/d by 1963. For a discussion of Mexico's refining difficulties, see *WPR 1957*.

The first major international oil investment in Mexico since 1938 will be for a carbon-black plant to be built by Phillips Petroleum Co. Pemex director Roldan said he expects Phillips to invest from 10% to 15% of plant cost; private Mexican capital (not Pemex) is to advance the remainder; Pemex is to supply oil used in the plant.

TRANSPORTATION: Several new pipelines are under construction, including a major new gas line from Tabasco fields to Mexico City, a 491-mile 24-in. line which will carry over 500 million cubic feet of gas daily. A gas line from Monterrey to Torreon is nearly completed, and a products line will be laid over the same route later. A financing agreement has been reached with Tubos de Acero SA for the products line.

PETROCHEMICALS: Mexico hopes to make the chemical industry one of the mainstays of her economy, and Pemex' program in this field provides for the following units: (1) *synthetic-rubber group:* butadiene plant; styrene plant; copolymerization plant; lamp-black plant; (2) *fertilizers:* ammonia plant; phosphorus refinery; (3) *detergents:* dodecylbenzene plant; (4) *aromatic oils and alcohols:* aromatic oil extraction; methyl alcohol plant; (5) *plastics:* ethylene concentration plant; polyethylene plant; (6) *miscellaneous products:* acetylene phenol. Pemex estimates total investment in these 13 industrial units will be US $109.6 million. The Law of November 1958 stipulates that all primary industrialization activities of petroleum resources (oil and gas) belong to the State, while later elaboration of basic petrochemical materials is to be left to private investors, Mexican and foreign. Different chemical companies, inside and outside the country, are preparing projects for investment in this field.

MARKETING: The impact of USA oil import restrictions on Mexico was lessened by the recent exemption of Mexican crude from import quotas.

Domestic consumption of liquid petroleum products in 1959 was about in the range of 96.2 million barrels. The rate of increase in domestic consumption again declined.

The volume of exports of crude and refined petroleum products during 1959 dropped for the second consecutive year. Direct exports and bunkers totaled 12,444,060 bbl, and 1.3 billion cubic meters of natural gas were also exported. Total value of exports was about $30.8 million. Imports are estimated at 13.4 million barrels having a value of approximately $57.8 million. Pemex total sales during 1958 were valued at about $323.1 million.

OIL LAWS

The oil laws of Mexico (and the rest of Central America) have been published in English translation, in *"Central America and Caribbean —Basic Oil Laws and Concession Contracts (Original Texts),"* available through *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

For a description of Mexico's oil laws see *WPR 1957* and, for a more condensed summary, *WPR 1958*.

A law of November 1958, plus regulations issued August 28, 1959, provides for cancellation of all remaining concessions to private interests for production, refining, or distribution of petroleum and gas products. It forbids any new contracts with private firms for drilling and other

MEXICO—Refineries
(As of July 15, 1959)
(Thousands of Barrels Per Day)

Name of Company &Location	Year	Crude Capacity	Thermal Capacity	Catalytic Operations: Cracking	Reforming	Hydrogen Processes: Poly	Hydrogen Processes: Alkylation	Lube
Petroleos Mexicanos Arbol Grande Tampico	1959	40.0						
Petroleos Mexicanos Atzcapotzalco Mexico City	1959	100.0	14.5	14.5		0.8	39.0	1.2
Petroleos Mexicanos Ciudad Madero Tampico	1959	100.0	5.5	0	12.0	1.7	0	
Petroleos Mexicanos Guaymes N.W. Coast	1959	0						
Petroleos Mexicanos Mata Redonda Tampico	1959	14.0	6.0					
Petroleos Mexicanos Minatitlan, Isthmus	1959	50.0	21.5			1.4		0.8
Petroleos Mexicanos Roza Rica	1959	7.0						
Petroleos Mexicanos Reynosa	1959	10.0	4.2					
Petroleos Mexicanos Salamanca	1959	40.0	5.0	10.0			9.0	2.4
Total		361	56.7	24.5	12.0	3.9	48.0	1.2	3.2

MEXICO—Crude Production, 1959
(US Barrels Per Day)

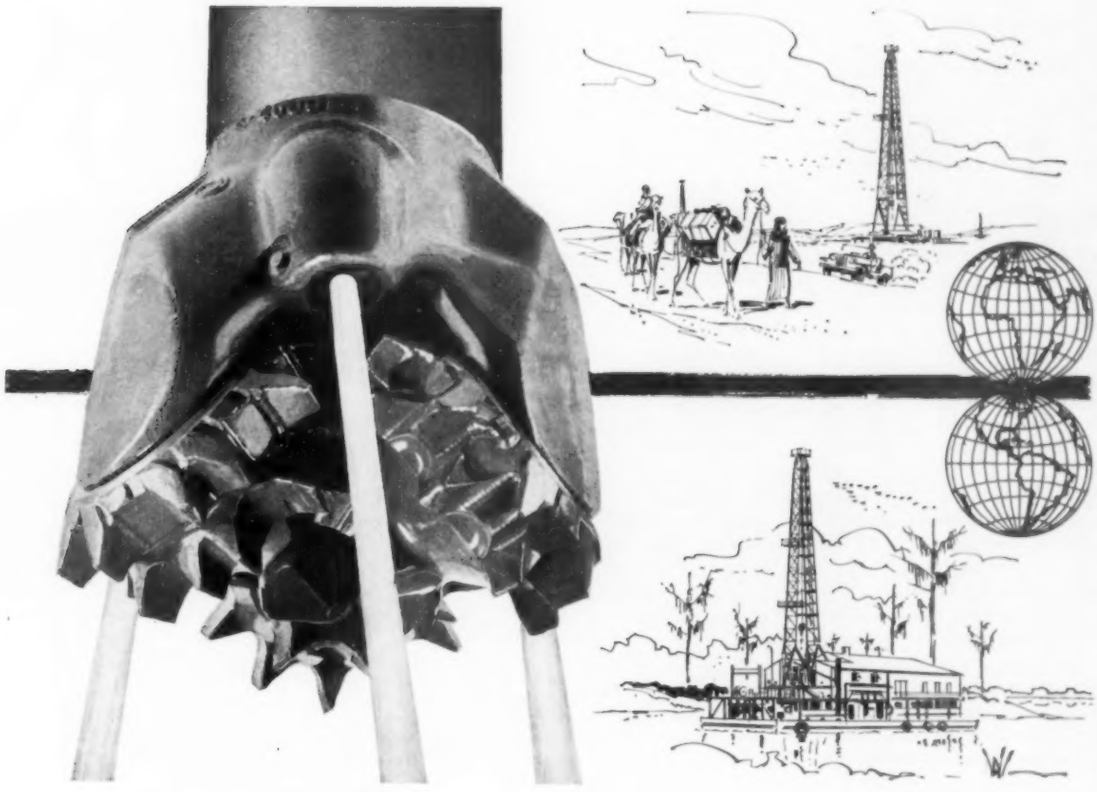
January	267,097	July	262,000
February	267,591	August	264,548
March	268,742	September	262,233
April	271,167	October	266,258
May	274,067	November	264,367
June	260,233	December	266,581

Year 1959 262,403 b/d

MEXICO—Estimated Crude-Oil Consumption
(Barrels of 42 US Gallons)

Production	1958		1957	
Crude oil		93,533,446		
Natural gasoline		7,107,959		
Total crude oil and natural gasoline		100,641,405		92,664,059
LESS:				
Exports	12,444,060[1]		17,149,036[1]	
Refinery losses	1,030,238		1,605,019	
Storage gain	4,142,465	17,616,763	...	18,754,055
Total domestic supply		83,024,642		73,910,004
PLUS:				
Imports		13,308,000[2]		18,407,333
Withdrawals from storage		...		500,314
Total apparent consumption		96,332,642		92,817,651

Increase 1958 over 1957: 3,514,991 bbl., or 3.8%.
Notes: [1]Includes bunkers. [2]Estimated.
Source: US Dept. of Commerce, Field Services.



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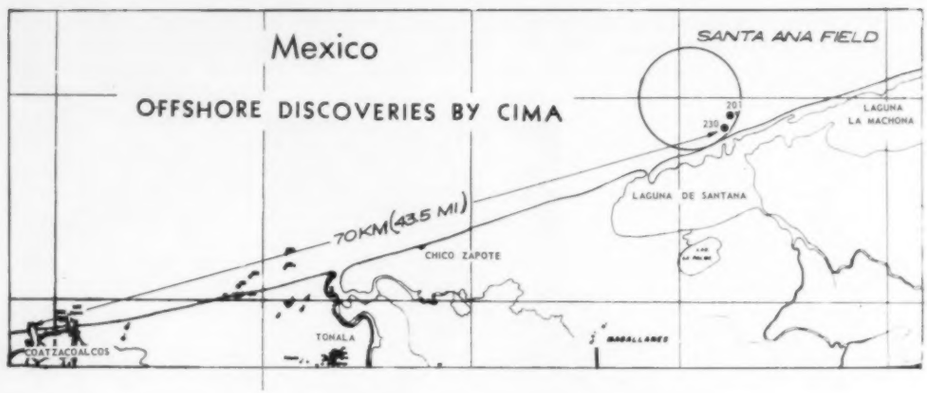
oil matters on a percentage-of-production basis. Only a fee basis is to be used in future contracts, effective November 30, 1959. Present percentage contracts are to be honored, but not extended. Under the legislation, the government asserts control over the petrochemical industry, and provides for the 100% nationalization of the oil industry, with indemnification, by virtual cancellation of confirmatory concessions which are oil rights confirmed prior to the constitution of 1917.

By a separate act, gasoline prices were raised to the equivalent of 32 cents per gallon for premium (about 90-octane), 25.6 cents for medium. Low-grade remains at about 17.6 cents.



NATIONAL FACTORS

The most difficult problem of Mexico's oil industry is the need for new working capital. This was solved to a degree during 1959 by a series of loans from US, British, and French concerns which provided about $115 million. Prices of products internally were raised as well, which relieves Pemex from a severe burden.

The publication of Pemex' balance sheet marked a new policy instigated by Sr. Roldan, Pemex' chief. In the 1959 Pemex budget, expenditures total 5,460 million pesos (US $436.8 million), and revenue is estimated at 5,200 million pesos (US $416 million). Efforts will be made to meet this 5% operating loss by economizing on some investments and accelerating the completion of new production installations. Part of the 1959 investment program will be met with the company's own resources, and part will be met with loans raised on the local money market or abroad. Specific major industrial projects for the year included: (a) the Ciudad Pemex-Mexico City gas line; (b) the Monterrey-Torreon gas line; (c) the Minatitlán ammonium plant; (d) the Salamanca ammonium plant; (e) the new Ciudad Madero refinery; (f) increased gas-recovery facilities and a new refinery at Azcapotalco; (g) further expansion of the Poza Rica refinery; (h) an aromatic extraction and processing plant in Minatitlán; (i) increased recovery and overall capacity of the Reynosa absorption plant; (j) two absorption plants in the southern part of the country; and (k) lubricant installations, a catalytic plant, and a new primry plant at Salamanca.

Petroleum is the basic industry in the Mexican economy, since some 92% of all energy is derived, directly or indirectly, from petroleum. The industry employs 46,000 people; and the value of its production, based upon sales data, represented 3.7% of gross national product during 1958.

The net effect of operating the Mexican petroleum industry on the principle that it should service all Mexicans is that Petroleos Mexicanos (Pemex) has never been able to acquire as much capital as it needed on an annual basis for the added facilities essential to keep the industry in balance with a constantly increasing demand. Given the situation of a capital stringency within the company, the Mexican government has been forced to provide the capital necessary for the industry to be expanded, and to give Pemex some access to working funds through the postponement of tax remittances due. The oil industry has been one of the heaviest drains on government resources over the years and one of the principal causes of deficit financing in the public sector.

GUATEMALA

EXPLORATION: The country's first oil hunt is well under way, and early in 1959 the first oil show was found. The discovery was in Ohio Oil Co.'s Chinaja well in Alta Verapaz, slightly below 10,607 ft in depth. About five barrels of crude, with no water, were recovered. The well is an a 10-mile anticline called the Arruga Grande, at the mouth of the Rio Dulce. Continental, Amerada, and Union oil companies are participants in the venture. Location is 15°-59′05″N, 90°13′05″W. A second test was drilling nearby at the year's end.

California Standard gave up on its initial wildcat on the Livingston joint operation in Izabel; it was a dry hole. The test, originally planned for about 7,000 ft, was carried below 8,348 ft without encountering oil or gas shows. The location is on Right No. 4, near the Caribbean coast, on the south bank of the Rio Dulce, 2½ miles up river from Livingston.

Guatemalan Atlantic Corp. spudded a well on January 22, 1959, about nine miles south of Flores in the Peten. The bit stuck at 410 ft, and the well was abandoned. The rig was skidded 30 ft, and a new hole begun March 31. Drilling had reached 1,000 ft by the end of May.

Petroleum Investments (Overseas) Ltd. (Shell) spudded in Laguna Blanca No. 1 on May 18, and abandoned it during late 1959 after some gas shows.

Signal Exploracion de Guatemala is studying location and drilling problems in anticipation of starting drilling soon. Belco Petroleum Corp. of America, Esso Standard (Guatemala) Inc., Hawthorne Investments, Petroleos Guatemaltecos, Signal, Ohio, and Union continued surface geology studies on their rights. Guatemalan Atlantic continued seismic shooting on its operations, Texas on its right, and Guatemalan Sun on its rights.

Five new concessions have been granted since late in 1958. They bring the total area under lease to 4,514,344 hectares (one hectare equals 2.471 acres). The new concessions are to Oscar Zimeri Nasar, 13,897 hectares in Right No. 54; Carlos Marroquin Gunther, 1,383 hectares, Right No. 55; Jose Miguel Torrebiarte S., 9,979 hectares, Right No. 56; Jose Miguel Torrebiarte S., 10,181 hectares, Right No. 57; Petroleos Atlas de Guatemala, 40,904 hectares, Right No. 58. The new concessions cover 66,-344 hectares. Guatemalan Sun Oil Co. was given increased areas in Right No. 14 over lands bordering on Belize and Mexico, bringing total to 116,431 hectares. Signal Exploracion was given surface reconnaissance rights for the entire country with certain restrictions. Carlos Crespo Siuibaldi sold his Right No. 47 to Ashland Guatemalan Co.

REFINING, PRODUCTION, MARKETING: There is no refining or production in the country. All consumption is imported, and during 1958 averaged 7,830 b/d. Imports are supplied throught the ports of San Jose and Puerto Barrios.

Breau Bridge Oil Refining Co. and a Shell affiliate have announced a 3,500 b/d refinery in the country, at Matias de Galvez. Lummus Co. began its construction during early 1960.

OIL LAWS

The text of all Guatemala's oil laws, including the long and detailed regulations which have not been available in translation before, has been published in *"Central America and Caribbean—Basic Oil Laws and Concession Contracts."* This publication, which contains the texts of oil laws in this entire region, has the virtue of presenting them in translation and keeping them up to date by means of supplements to the original volume. It is available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

There has been little change in the various factors listed in *WPR-1958* and *1957* (no review was contained in *WPR-1959*). Taxation remains at a maximum 43% on income. The quetzal, equivalent to one US dollar, is convertible, and there are no exchange regulations. The attitude of the government is friendly toward international capital, although considerable agitation, some of it via the Minister of Agriculture, has arisen concerning American aid. Most of this was stimulated by political motivation.

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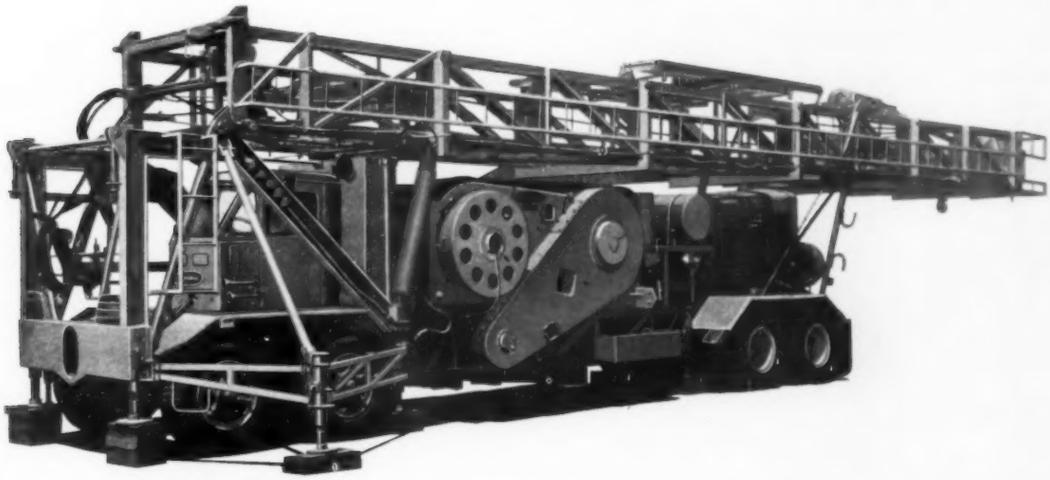

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NICARAGUA

EXPLORATION: The offshore well described in *WPR 1958* came in dry, and Gulf gave up its interest in the d'Escoto concession (see map in *WPR 1957*).

Compañía Central de Petroleo y Gas SA, backed by USA interests, has solicited approximately one million acres along the northern shore of Lake Nicaragua.

Four concessions over a total one million acres were acquired in May 1959 by Occidental Petroleum Corp. via the Empire Trust Co. of New York. Two wells were planned to about 10,000-ft. depth within the following six months. The acreage runs north along the coast from Costa Rica almost to Honduras. The proposed drill sites are in the Rivas and San Cayetano areas.

PRODUCTION, REFINING, MARKETING: There is no crude production. Esso Standard has requested permission to build a 10,000 b/d refinery at Corinto. The agreement is still under negotiation, however.

OIL LAWS

The new oil law, Decree 372 "Special Law on the Exploration and Exploitation of Petroleum," has been published, along with other laws of Central America, in *"Central America and Caribbean—Basic Oil Laws and Concession Agreements (Original Texts)."* The volume is available through *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N.Y.*

The only known concession in the country is the Miguel d'Escoto holding summarized in *WPR 1957*.

A summary of Decree 372 accompanies this section.

OIL LAW SUMMARY

All subsoil State property. Country divided into four zones—Pacific, Central, Atlantic, Continental Shelf.
RECONNAISSANCE: Freely done under special permit. No fees payable.
EXPLORATION: Duration: 3 years. Renewable for 3 years. **Area:** 370,500 acres in Pacific Zone, 741,000 acres in Central, 494,000 acres in Atlantic, 741,000 acres on Continental Shelf (Pacific side)—988,000 acres (Atlantic side). **Maximum Per Concessionaire:** Three times maximum concession area. **Bond:** 40 US cents per hectare in Pacific zone, 15 US cents Central, 30 US cents Atlantic, 25 US cents on Continental Shelf. **Minimum Investment** (US cents per acre): Pacific, 16; Central, 6; Atlantic, 12; Continental Shelf, 10. **Annual Exploration Tax** (US cents per hectare): Pacific, 5; Central, 0.2; Atlantic, 4; Continental Shelf, 3. During extension, rates raised US two cents per hectare.
EXPLOITATION: Conversion guaranteed if commercial discovery made. Equivalent amount to exploitation area must be returned. If no discovery made, conversion may be done with return of 50% exploration area to govt. **Drilling Obligation:** 5,000 meters per 247,000-acre concession area during first seven years; 10,000 meters (in two or more wells) per 49,400 acres during following eight years. **Area:** Maximum 50% exploration area, selected by concessionaire. Maximum per concession, 61,750 acres. Maximum per concessionaire, from 225,000 hectares Pacific zone to 600,000 hectares on Continental Shelf. **Duration:** 40 years. Extendible 20 years. **Initial Exploitation Tax** (payable once): Pacific, 20 US cents per hectare; Central, 8; Atlantic, 12; Continental Shelf, 10. **Annual Surface Tax** (US cents per acre): From first year graduated up to 40th year; Pacific, 6-20; Central, 2-20; Atlantic, 4-20; Continental Shelf, 4-20. **Royalty:** 10% on 5,000b b/d, graduating to 16 2/3% on 15,000 b/d and up. Gas, 11.5%. **Income Tax:** Subject to general tax (maximum now at 18%. **Depletion Allowance:** 27.5% gross less royalty, up to 50% of net. Maximum all payments to government, 50%.
REFINING AND TRANSPORTATION: 40-year concession granted to exploitation concessionaire on request. Must begin operations within one year. Must transport compatible oils belonging to third parties or government on request. Refining concessions subject to tax equivalent to 50% of taxes which would have been levied on equivalent imported products. Transportation concessionaires pay 2% tax on amounts received for third parties' oil.

NATIONAL FACTORS

Principal factors affecting investment are described in *WPR 1957*. No change has occurred, except in income-tax rates on corporations which have been raised to 30% maximum.

PANAMA

EXPLORATION: No discoveries have been made and interest slowed when the only company actually drilling, Champlin Oil & Refining, bottomed its second well, Agua Cay 1, at 6,678 ft with no oil shows. No further drilling is to be done until comprehensive study of geological data has been undertaken.

The Maroilco Corp. of Florida began exploration in the Darien region of Panama in early 1959. At present, the Delhi Corporation is the only oil company conducting exploration work in the Darien, which is close to the Colombia border. Delhi started deep drilling in 1959. Seismograph testing, which has been going on for over a year on the concessions, will also be continued.

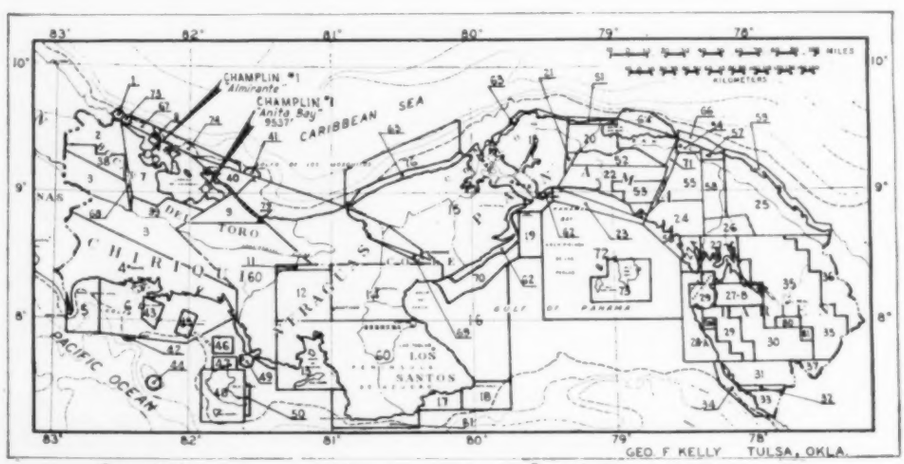
PRODUCTION & REFINING: There is no production, and there are no refineries as yet, although plans for two major plants have been announced (see WPR—1957).

OIL LAWS

Panama's oil law, and the recent concession under which Champlin Oil operates, has been published in English translation, in Central America & Caribbean—Basic Oil Laws and Concession Contracts (Original Texts). Copies are available through Petroleum Legislation, P. O. Box 1591, Grand Central Station, New York 17, N. Y.

The oil law of Panama is being completely revised with the aid of U. S. consultant Elmer Batzell of Washington, D. C. The law was not passed as of the end of 1959.

Panama
World Petroleum Report Concession Map



Concessionaire	Area
TRADEWINDS EXPLORATION OF PANAMA S.A.	1,8,10,31,32.
UNION OIL CO. OF CALIFORNIA y CARIBBEAN GULF OIL CO.	2.
CORPORACION HEMISFERICA DE GAS y PETROLEO S.A.	3.
CIA. PETROLERA CHIRICANA S.A.	4.
CIA. BURICA S.A. (pending)	5.
PANAMA OIL R.F.O.S.A. (pending)	6,16.
CHAMPLIN OIL REFINING CO.	7.
JERONIMO ALMILLATEGUI (pending)	9.
DOUGLAS E. JONES (pending)	11.
E. RAYMOND MOSS (pending)	12.
JOSE A. SOSSA y SATURNINO FLORES	13,17.
CIA. PETROLERA ISTMENA S.A.	14.
CIA. PETROLERA DEL GOLFO DE SAN MIGUEL	15A.
CIA. PETROLERA DEL GOLFO DE SAN MIGUEL S.A.	15B.
JUAN DE DIOS POVEDA (pending)	18.
CIA. PETROLERA CHIMAN S.A.	19,23,24,56,73,74,76.
PAN AMERICAN PETROLEUM CORP. (pending)	20.
FELIPE BARRIA	21.
CORPORACION PETROLERA S.A.	22.

Concessionaire	Area
SOSSA PETROLEUM S.A.	25,33,37.
ALMILLATEGUI, SOSSA y FLORES	26,55,58.
CIA. PETROLERA BALBOA S.A.	27A,27B,28A,30,36.
CIA. PETROLERA COCLE S.A.	27C,28B.
PANAMANIAN DELHI PETROLERA, INC.	29,35.
ROBERT D'ORSAY	34,41,42,44,49,51.
NELSON BARRAGAN	38.
EDUARDO A. CHIARI	39,52,53.
TEXAS AMERICAN PETROLEO DE PANAMA S.A.	40.
HORACIO VALARDE	43,45,46,47,48,50,59.
FRANCISCO MARTINELLI, JR.	54,57,70.
EASTERN STATE PETROLEUM CORP. OF PANAMA S.A.	60,63.
JUAN AYALA E.	61,66,69,71.
CIA. PETROLERA TABOGA S.A.	62,64,65.
JORGE FABREGA P.	67,68.
JULIO HEURTEMATTE	72.
AGUSTIN DONDERIS VERDOY	75.
CARLOS E. BIEBARACH	77.
PEDRO MOSCOSO	78,79.

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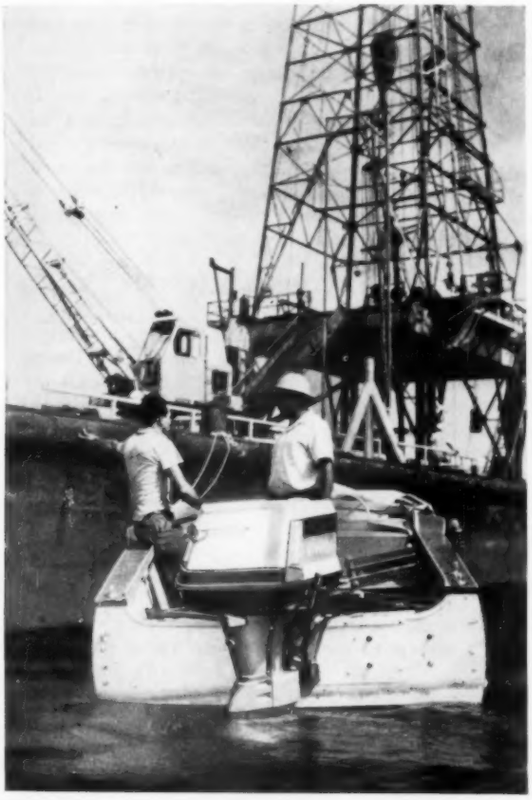

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TRINIDAD

EXPLORATION: With most onshore prospects drilled up, exploration has been trending offshore (see WPR 1957—p. 247). Production continued to increase steadily—the only country in the Western Hemisphere which showed such an increase.

One of the active companies offshore is Dominion Oil Ltd., subsidiary of Standard of California. Dominion Oil is reported to have a good oil find in its South Domoil 1 and 2. The wells are offshore, and No. 1 South Domoil produces from perforations in a zone from 9,340-70 ft. Flows were not given but the well has produced 20,000 b/d since Sept. 30. South Domoil 2 was perforated at 8,474-9,370 ft. A third well is drilling, about ½ mile east of No. 2.

Dominion Oil Co. agreed late in 1958 to pay $5,600 for exploration rights on 1,581 acres, south and east of the island, plus $3.50 per acre for other lands up to 11,000 acres, with drilling to start within three months after award of leases.

Texaco Trinidad Inc. started drilling in 1958 the first of 36 wells planned for a mammoth permanent platform set in 68 ft of water off the Brighton terminal.

PRODUCTION: Levels of crude production have continued to rise steadily, averaging 111,849 b/d for the first nine months of 1959; 102,343 b/d for the year 1958; and 93,325 b/d during 1957. About 68% of production is from 943 flowing wells, 20% from 1,655 pumping wells, and the remaining 12% from 561 air-gas lift and plunger lift producers.

Natural gas production in the first half of 1959 totaled 43,776,061,000 cubic ft. For the year 1958, gas production was 79,190,000,000 and for 1957 it was 65,418,000,000 cubic ft.

REFINING: Along with the increased crude output refinery production has been rising. Oil processed by Trinidad's three refineries averaged a record 189,265 b/d for the three months July through September 1959. Average for the year 1958 was 165,000 b/d, and for 1957 it was 138,000 b/d. A $18 million expansion program will double the capacity of Texaco's 125,000 b/d refinery at Pointe-a-Pierre. No starting or completion date has been mentioned. (As of December 1959, capacity was reported as 135,000 b/d). The plant's present capacity has risen from a level of 75,000 b/d three years ago.

W. R. Grace & Co. is working on a plan for a fertilizer plant. The basic unit will be a synthetic anhydrous-ammonia producer using hydrogen derived from locally produced natural gas. Its capacity will be on the order of 100 tons per day. A new company, Federation Chemicals Ltd., will be formed to operate the $16 million plant. In addition, Grace is understood to be planning to invest seven million BWI dollars in other chemical facilities.

MARKETING: During late 1959 the Levy report on Trinidad was made public. It defined Trinidad's three principal marketing considerations, all of them of international aspect since the Island depends principally on international oil trade, directed mainly to Europe and West Africa, which markets account for the bulk of the increase in exports since 1952. First, Europe has had to rely on product imports to supplement its own refinery output, despite major refinery expansion during the postwar period. But additions to European refining capacity so as to provide larger fuel oil yields have cut down on Europe's fuel oil gap. Second, pricing of products in Europe on the basis of Caribbean quotations plus freight has permitted Trinidad exports to reach these markets competitively. But here again, continuing refinery expansion and recurring product surpluses have led to price reductions below the level of import parity. As the tie between European product prices and the c.i.f. cost of Caribbean supplies is weakened —moving in the direction of import costs for Persian Gulf crude plus competitive refining margins in the various countries—Trinidad's exports face both a narrowing market and a less advantageous price situation than has been the case up to recently. The expansion of refining facilities in consuming countries of Central and South America and the possible emergence of a common market or free trade area there also threaten the market potential for Trinidad's product exports.

The channels through which products move to markets, the extensive and diverse market outlets of the international companies are the third, and probably the most significant, consideration affecting Trinidad's product export position. Oil may move through their distribution channels where it might not otherwise be strictly competitive on the basis of price considerations alone. In sum, refining operations in Trinidad play a central role in establishing the export position of its oil.

OIL LAWS

Present oil regulation in Trinidad, as summarized in World Petroleum Report—1957, page 247, will probably undergo a revision during 1960. The Levy report mentioned earlier was explicit in criticizing aspects of existing oil regulation. Performance obligations are not specified, except for a general requirement of "due diligence" in the case of off-shore exploration, and that requirement would not apply "so long as the royalty payments equal or exceed the dead rents." Nor is there any requirement under existing leases for relinquishment of acreage or, after a reasonable time, for developing production.

Performance commitments as to exploration and exploitation—that would also prove reasonably acceptable from the standpoint of operating companies—might therefore be sought. Similarly, the Levy Report it would seem reasonable to explore the possibility of instituting acreage relinquishment, after adequate time for testing of acreage and taking into account the special problems of offshore operations. Trinidad's 10% royalty rate is not high, but in Trinidad, field storage value of crude oil is related by formula to the volumes of products thereof and the level of respective product prices of export cargoes at the U. S. Gulf. Actual royalty payment has apparently ranged between 12 and 13% in recent years. The field-storage-value formula tends to subject government royalty income to uncertainties associated with fluctuations in world product prices. In general it might prove advisable to bring Trinidad's royalty rate more closely in line with modern concessionary practices, and the valuation of crude in line with commercial relationships as determined by competitive force in the Caribbean area.

NATIONAL FACTORS

A potentially dangerous situation appears to have been averted by the report of Mr. Walter J. Levy, well-known consultant from the United States, who calmed the waters which began to roil some years ago. Venezuela at that time had received substantial sums from bonuses for new concessions which were much envied in Trinidad. The Levy Report presented a well-balanced appraisal which received the approval of both government and industry.

Among its recommendation was the adoption of a 50-50 profits sharing basis for oil operations, excluding refining which would be hard pressed to meet competition and might therefore remain subject to Trinidad's general income tax of 40%. In view of the fact that the refining margin is precarious at best and that refining losses on the processing of substantial volumes of foreign crude could subtract seriously from the profitability of operations involving Trinidad oil, a processing-fee arrangement may be considered for that part of refining which operates on imported crudes.

In Trinidad, government revenue has been less, but apparently not significantly different from a 50-50 sharing of industry earnings. If off-shore potential is as good as early indications suggest, then the profitability of oil operations could improve substantially and the existing tax structure fail to win an equivalent share of oil revenues for the government. Furthermore, the opportunity of taking percentage depletion on income from off-shore operations (at a rate of 20% of the gross value of production by 1966 and through 1982) would seriously subtract from the profits base on which income taxes would be computed. If the 50-50 arrangement commends itself as reasonable to both government and industry, then it would appear that a commitment by government voluntarily to limit its taxing power could be accompanied by an elimination of percentage depletion.

TRINIDAD GOVERNMENT OIL REVENUES, 1952-1957

(U. S. Dollars)

	1957	1956	1955	1954	1953	1952
Total Government Revenue ('000)	$26,109	19,385	17,732	15,043	14,757	15,309
Total Revenue per Barrel	$ 0.77	0.67	0.71	0.64	0.66	0.72
Total Royalty Income ('000)	$ 8,201	5,966	5,079	4,802	4,090	3,846
Royalty per Barrel	$ 0.24	0.21	0.20	0.20	0.18	0.18
Income Tax Receipts ('000)	$16,139	11,451	10,982	8,571	9,085	9,970
Income Tax per Barrel	$ 0.47	0.40	0.44	0.36	0.41	0.47
Production* (Thousands of Barrels)	34,062	28,929	24,896	23,629	22,346	21,258
Average Value (As assessed for Royalty)	$ 3.16	2.61	2.47	2.30	2.20	2.13

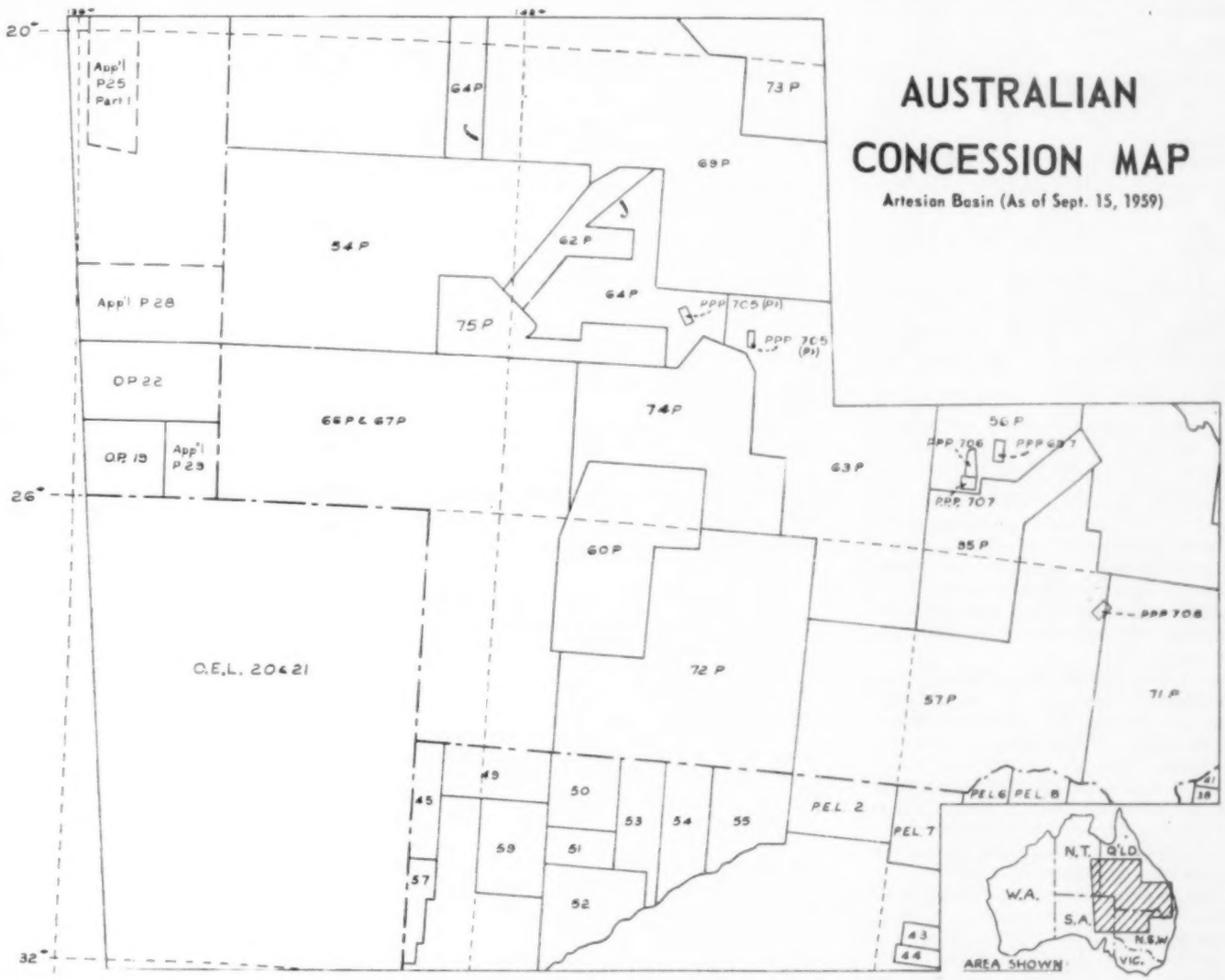
*Includes production on private leases.
Source.—Trinidad and Tobago Petroleum Department, Annual Administration Report.

FAR EAST

AUSTRALIA

EXPLORATION: The number of companies exploring in Australia is growing steadily, attracted by the political and legal climate and by the growing internal market. As accompanying maps show, exploring companies include several majors such as Standard-Vacuum, Gulf Oil Corp., Texaco, and Standard of California. A recent entrant is Conorada Petroleum Corp., joint subsidiary of Ohio, Amerada, and Continental companies. Others include Carl M. Loeb, Rhoades & Co., Plymouth Oil Co., of Pittsburgh, Phillips Petroleum Co. and Sunray Mid-Continent Oil Co., Sterling Oil of Oklahoma Inc., Magellan Petroleum Corp.—formerly Santiago Petroleum, Texas American Oil Corp., Union Oil Co. of California, Kern County Land Co., Murphy Corp., and Three States Natural Gas Co.

During 1959 a deep test was drilled in South Australia on a huge structure known as Innamincka. Slight traces of oil and gas were recovered from Innamincka No. 1 well in a core, taken between 4,030 ft and 4,048 ft of 15 ft of gray, very fine-grained, light, silty sand. Later examination of the core revealed sand to have no commercial significance. The company is drilling a second exploratory test—this one in Queensland—on the Betoota structure. The



LEGEND

Conorada Petroleum Company	75 P	Planet Exploration Co. Pty. Ltd.	P.P.P. 706, P.P.P. 697
Australian American Oil Co. Pty. Ltd.	74 P	J. G. Fuller	P.P.P. 707, 59
Papuan Apinaipi Petroleum Co. Ltd.	54 P	B. C. Hancox	38, 41
Associated Australian Oil Fields N.L.	55 P	Builders Inc. Pty. Ltd.	43
Associated Freney Oil Fields N.L.	56 P	J. A. O'Shea	44
Australian Oil & Gas Corp. Ltd.	57 P, P.E.L. 2, 7, 8	Clarence River Basin Oil Exp. Co. N.L.	45
L. H. Smart Oil Exploration Oil Exploration Co. Ltd.	60 P, 50, 51	P. E. Gauld	49
Magellan Petroleum Corporation	63 P	R. B. Withers	52, 53, 54, 55
Carpentaria Oil Pty. Ltd.	64 P	Harver Corporation Ltd.	57
Santos Ltd. & Delhi Aust. Petroleum Ltd.	66 P, 67 P	Geosurveys Australia Ltd.	P.O. 19
Artesian Basin Oil Co. Pty. Ltd.	69 P	3 States Australia Petroleum Ltd.	P. 28
Queensland American Oil Co. (½) Phillips (¼) Sunray (¼)	71 P	Texas American Oil Corporation	P. 29
Stekoll Australian Petroleum Ltd.	73 P	Trans Pacific Petroleum Exp. Synd.	P. 25
Phillips (½) Sunray (½)	72 P	Magellan Petroleum Corp. (¾) Cent. Q'Ld Pet. Co. Ltd. (¼)	62 P
Condamine Oil Ltd.	P.P.P. 708	Delhi Aust. Petroleum Ltd.	O.E.L. 20/1, O.P. 22
Longreach Oil Ltd.	P.P.P. 705	Santos Ltd.	O.E.L. 21/1

government will pay up to $337,000 on the test. Seven British, Australian, and American firms participated in the Innamincka well and the 110,000-square-mile concession. Santos Ltd., Dehli Australian Petroleum, and Frome-Broken Hill Pty. each has a one-third undivided interest in the venture. Delhi Australian is a subsidiary of Delhi-Taylor, of Dallas, Texas. Frome-Broken Hill is owned 31% by Stanvac, 31% by BP, 31% by Zinc and Interstate, and 7% by American Metal.

Australian Oil and Gas Corp. Ltd. was encouraged when it found a flow of natural gas at Camden, New South Wales, early in 1959. Preliminary measurements indicated initial open-flow potential of one million cubic feet per day.

West Australian Petroleum Pty. Ltd. has reported slight showings of oil in its Media No. 2 well between 5,294 ft and 5,298 ft. Media No. 2 is the most encouraging show since 1953. Offshore work is to be done during 1960. The company has spent about $50 million to date without discovery.

Oil shows were found in a stratigraphic test core taken at 3,700 ft in the sandhills at Beagle Ridge, 80 miles south of Geraldton, West Australia, by Oil Drilling and Exploration Ltd.

Humber Barrier Reef Oil Pty. Ltd. struck what is believed to be basement at 1,795 ft in its 1959 exploratory well on Wreck Island, Great Barrier Reef, off Queensland.

Exoil Pty. Ltd., in October 1959, planned early drilling on its first well near Madura Pass, 320 miles east of Norseman.

A detailed history of Australian exploration and a concise résumé of geology are contained in the *Bulletin of the American Association of Petroleum Geologists* for February 1959.

PRODUCTION, REFINING, MARKETING: There is no production. All oil used is imported, 98% of it refined locally. By 1962 the crude-oil throughput capacity of Australia's oil refineries is planned to exceed 15 million tons a year (300,000 b/d), an increase of 31% on the current capacity of 11.4 million tons a year (228,000 b/d).

Known new additions to throughput capacity of Australian refineries in the next three years will be a doubling of the present capacity of the Kurnell (NSW) refinery, bringing it up to 4,100,000 tons a year (82,000 b/d) and the erection of a new 1,550,000-ton-per-year (31,000 b/d) refinery at Hallett's Cove (SA) on which construction will begin in 1960.

Considerable expansion is planned in the petrochemical industry as well. Vacuum Oil Co. Pty. Ltd., working with several Australian and overseas industrial groups, early in 1959 announced a project for the erection of four separate but integrated plants to be based on feed stocks from its Altona (Victoria) refinery. The key unit is a cracking plant which will manufacture butadiene and ethylene at the rate of 20,000 tons a year for use by the other three projected units. The butadiene will be used to make GR-S synthetic rubber in a second plant to be erected by the Australian Synthetic Rubber Co. Ltd., a subsidiary of Vacuum, in which Goodyear Tire and Rubber Co. (Aust.) Ltd. has a substantial interest. Styrene for synthetic-rubber production will come from another plant which is to be jointly owned by Colonial Sugar Refining Chemicals (an Australian concern in which Distillers, London, has a two-fifths interest) and Dow International (USA). This unit will also manufacture polyethylene. A fourth new plant will also manufacture polyethylene. This is to be owned by Union Carbide Australia Ltd., an affiliate of Union Carbide Corp., New York. All these plants are expected to be in operation by 1961.

A £A2,000,000 factory to produce carbon black from feed stocks provided by the Standard-Vacuum refinery has recently been completed at Altona by Australian Carbon Black Pty. Ltd.

A detergent alkylate plant is to be built at Geelong, Victoria, by Shell Chemical (Australia) Pty. Ltd. The company recently opened a sulfuric-acid plant at Geelong, and also announced its decision to build an "Epikote" resin plant at Clyde, Sydney.

Further, at Silverwater, near Sydney, petrochemicals—beginning with styrene monomer—are to be produced by Australian Petrochemicals Ltd., a company set up in July 1959 by Petroleum Chemical Corp. (Aust.) Ltd. (PACCAL) and Monsanto Chemical Co. (USA). PACCAL itself is to build a plant for the manufacture of high-purity benzene, toluene, and xylene.

B. F. Goodrich Chemical Co. (USA) is joining CSR Chemicals Pty. Ltd. to build another plant, to produce polyvinyl chloride from ethylene and chlorine.

Pipelines: There are no major crude lines in Australia. One of the largest products lines is the 34-mile 8-in. line from the Shell refinery at Geelong to the distribution depot at Newport, near Melbourne. It has a capacity of 225 million gallons per year.

Consumption: Demand for oil has been increasing rapidly, until oil now supplies 35% of total energy requirements, compared with about 22% in 1946. Demand for oil has tripled over the 1946-57 period.

OIL LAWS

During 1959 the oil laws of all Australian states were published in a compilation entitled *"Asia and Australasia—Basic Oil Laws and Concession Contracts (Original Texts)."* It contains the verbatim oil law texts, including Papua and New Guinea. Other volumes in related series cover the rest of the world. Supplements to the original set of volumes keep the oil laws up to date by the addition of new legislation as it is passed. Requests for information should be directed to the publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

For a summary of the Queensland law, see *World Petroleum Report 1959*, p. 130. The law of Western Australia is summarized in this report.

Oil legislation is exclusively the competence of the various states of Australia. However, the federal government has contributed with tax incentives and subsidies to drillers.

WESTERN AUSTRALIA—OIL LAW SUMMARY

The following summary of Western Australia's oil rules has been prepared by a recognized Australian authority on oil legislation, Ralph J. Stoddard, Barrister and Solicitor, WA Trustee Buildings, 135 St. George's Terrace, Perth, Western Australia.

The following summary of legislation is of the governing law of Western Australia, which is a state of the Commonwealth.

Oil exploration in Western Australia is governed by the Petroleum Act 1936/54. There is no pending petroleum legislation. Sect. 9 of the principal act in 1936/54 expropriated without compensation all petroleum on or below the surface of all land within the state of western Australia.[1] Under the Petroleum Act of Western Australia, the principal features of the three successive stages of oil and gas rights are as follows:

[1] The validity of this section and its effects on crown grants issued prior to and subsequent to the act was contested in the Midland Railway Co. of Western Australia Ltd. v. the state of Western Australia and West Australian Petroleum Pty. Ltd. The case was heard in the Supreme Court of Western Australia in November 1955 before Dwyer, C.J., and there was an appeal to the Privy Council which was heard in June 1956. As a result, there is no question of anyone other than the crown owning mineral oil in Western Australia other than in accordance with the act.

PERMIT TO EXPLORE: Minimum Area: 1,000 sq. mi. (640,000 acres). **Limitation on Number of Permits:** None. **Filing Fee:** A£ 100 (US $224). **Bond:** A£1,000 (US $2,240). **Term:** 2 years; renewable for further successive periods of 12 months each. **Geological Survey:** Employ a geologist within three months and carry on geological survey. Supply quarterly reports. **Rights Granted:** Exclusive right to explore for petroleum. **Surrender:** May surrender at any time, in whole or part, with consent of the Minister. Report occurrence of any petroleum discovered to the Minister immediately. **Drilling:** Only "scout" drilling permitted, and that only with the consent of the Minister.

LICENSE TO PROSPECT:: Eligibility: Granted to holder of a permit to explore, who has fulfilled obligations as permittee, on a portion of land specified in permit. **Number of Licenses:** One or more licenses to prospect may be granted to same person. **Maximum Area of Licenses:** 200 sq. mi. (128,000 acres). **Minimum:** 8 square miles except with approval **Bond:** A£1,000 (US $2,240). **Term:** 2 years; three renewals of one year each. **Rights Granted:** Exclusive right to prospect for petroleum. **Fees:** 5 shillings per square mile (56¢ US), with maximum fee of £12,10s (US $27.90), for first year. Thereafter, 10 s. ($1.12) per square mile annually, with maximum fee of £25 ($56) per annum. **Geological Survey:** Commence detailed geological survey within 6 months from date of license. **Drilling:** Licensee shall conduct no drilling operations nor drill any test well without written consent of Minister, who may specify technique and material to be used. **Records:** Furnish monthly reports and advise immediately if petroleum encountered.

PETROLEUM LEASE: Eligibility: Governor may grant petroleum lease to any person domiciled within or company formed within Commonwealth of Australia, and under exceptional circumstances to approved persons not so domiciled. **Maximum Area:** 100 sq. mi. (64,000 acres). **Minimum:** 4 sq. mi. If license granted before January 1, 1955, holder who discovers oil is entitled to select within six months whole area of license to prospect. Where license granted after January 1, 1955, holder discovering oil is entitled to apply for half the area as oil leases. The remaining half can be disposed of by the government. License holder has first right to acquire on the new terms. **Royalty Rate:** Not less than 5% nor more than 15%, as fixed in lease. **Refining:** Refine all crude in Western Australia, or in some other part of Australia approved by Minister. **Export:** Lessee is not to ship or export crude oil to any place outside Australia without consent of Minister. **Continuous and Exclusive Use:** Lessee is to use land continuously and bona fide exclusively for purpose for which it is held, in accordance with act and regulations. **Surrender:** Lessee may surrender lease at any time, with consent of governor. **Regulations:** Governor may issue regulations concerning operating matters and administrative details, as specified in act or as reasonably required by accepted practice. **Export:** Producer must supply all domestic consumption requirements before export.

The federal government has introduced new tax concessions to encourage investment of more money in oil search in Australia and its territories. The government will grant another $2¼ million a year in the next three years for geological surveys and other exploration work. Under Sect. 77a of legislation approved in 1958, all money Australian companies and individuals invested in the search for oil since September 30, 1958, has been tax-free. This provision does not apply to capital invested by nonresidents or by Australian companies controlled from abroad. The government allows all Australian companies, including the Australian subsidiaries of overseas companies, to receive the concession for money paid after September 30, 1958.

NATIONAL FACTORS

The various incentives which have led to investment by oil companies in Australia include the growing internal market, all of which would be available to a producing company, and the liberal governmental attitude which encourages oil exploration in almost every possible way.

There are some disadvantages to Australian operations, among which must be included the lack of trained oil labor and the tendency of employees to change jobs frequently.

GEOLOGICAL BIBLIOGRAPHY

Among the available geological publications on Australia are the following: *The Geology of the Fitzroy Basin, Western Australia, Bulletin No. 36.* By Dept. of National Development, Bureau of Mineral Resources, Geology and Geophysics, Canberra, Australia. Other publications by the same source are: *Stratigraphy of the Lower Murchison River Area and Yaringa North Station, Western Australia; The Cambrian Geology of Australia, Bulletin No. 49; Permian Bryozoa from the Fitzroy Basin, Western Australia, Bulletin No. 34; The Geology of Dampier Peninsula, Western Australia, Report No. 13; Permian Productacea of Western Australia, Bulletin No. 40; The Geology of the South-Western Canning Basin, Western Australia, Report No. 29; Lower Permian Pelecypods and Gastropods from the Carnarvon Basin, Western Australia, Bulletin No. 41; Permian Foraminifera of Australia, Bulletin No. 48.*

BURMA

EXPLORATION: For the history of Burma's oil industry, which goes back more than 50 years, see *World Petroleum Report 1957,* p. 62. There was little exploration activity during 1959. The major news was that the Burmah Oil Co.'s Kyaiklat well No. 1 bottomed at 11,990 ft in 1959. Further work is necessary before the evidence secured can be fully assessed, but the results are reported as sufficiently promising to justify further drilling in the Irrawaddy delta area. A new drilling site was prepared near Dedaye, and seismic work continued farther north to find other suitable areas for exploration drilling. Meanwhile, Ondwe well No. 7 was completed at 8,869 ft, and production tests were in progress to determine finally whether produceable oil or gas is present: Future plans await the results of these tests.

The first deep exploratory test outside the known limits of the shallow Chauk field will be carried to 9,000 ft. Chauk wells vary from 1,800 ft to 4,700 ft. Burmah Oil Co. (1954) Ltd. says it expects the Chauk well to meet very high pressures at the deeper levels.

Murphy Corp., a USA independent, entered into an agreement with The Burmah Oil Co. Ltd. It covers "certain cooperative efforts in exploration for new reserves of oil and gas in the Western Hemisphere and possibly in other areas as opportunities arise." Definite locations have not been decided upon as yet by the Burmah-Murphy group. Burmah has formed a wholly owned subsidiary in the United States known as Burmah Oil Western Co. to carry on its share of the cooperative activities with Murphy.

Six concessions covering about 2,000 square miles were awarded to General Exploration Co. of California in 1959. They have a 2-year duration.

A joint Japanese-Burmese oil venture is reported under study by the government. Japanese interests from Osaka (not Maruzen Oil) are said to be offering equipment and technical assistance.

Reserves: Proved oil reserves in Burma are now only about six million tons (45 million barrels), of which about 75% are in the Chauk area. All the known fields lie along the Irrawaddy-Chindwin valley; and, although oil is also known to exist at Indaw in the north and in the Arakan coastal belt, these areas have not recently been prospected due to insecurity and inaccessibility. The possibilities of extending the present producing areas either laterally or by drilling for deeper sands are by no means exhausted.

PRODUCTION: During 1959, production continued to rise slowly, reaching about 10,000 b/d, compared with about 8,085 b/d during 1957.

REFINING: Burmah Oil Co. (1954) Ltd. has a 3,000 b/d skimming plant at Chauk and a 3,500 b/d skimming plant at Syriam. There is also a small plant at Yenangyaung, owned by Nathsingh Oil Co. Ltd., which has 480 b/d capacity, with a wax plant.

TRANSPORTATION: The 275-mile Chauk-Syriam pipeline, destroyed during the war, has still not returned to service.

OIL LAWS

A new oil law has been under consideration by the government for some time, and is now complete but still awaiting action by the government on it. For a review of the provisions of this proposed law, see *World Petroleum Report 1958,* p. 235.

NATIONAL FACTORS

Government Petroleum Policy*: The government's attitude toward international investors was defined by the Honorable M. A. Raschid, Minister for National Planning and Mines, in saying: "Our present and future policy with regard to the participation by private enterprise in the development of our undiscovered petroleum resources has been and will be to encourage private capital to come in, and to guarantee the terms before an investment is made."

Other aspects of the country's investment favorability are less encouraging. The government participates with one-third interest in the Burmah Oil Co. (1954) Ltd., and would probably demand participation in any new company as well. The constitution provides for nationalization of enterprises, and several processing and distributive enterprises were nationalized in 1950. The outlook and objective of the government is the "Welfare State," and operations are generally closely controlled.

* See *International Oilman,* mid-November 1958 issue, p. 358.

BURMA—Drilling in 1958-59
(The Burmah Oil Co. (1954) Ltd.)

Well Location	Date Spudded	Completed	Total Drilling Depth (Feet)	Result
Ondwe No. 7	August 15, 1958	December 17, 1958	8,870	Well abandoned
Kyaiklat No. 1	September 17, 1958	December 12, 1958	11,990	Well abandoned
Dedaye No. 1	March 3, 1959	June 13, 1959	10,928	Well abandoned
Payagon No. 1	August 24, 1959	Drilling	—	—

NOTE: A deep test in the Chauk oil field (Chauk well No. 1,000) was spudded, June 1, 1959; drilling continues.

A REVIEW & A FORECAST

Ethyl takes stock of 1959 and tells what developments the Oil Industry can expect from us in 1960

AT THIS TIME OF YEAR, it's sound business practice to review the past and look at what's in store for the year ahead.

Ethyl Corporation looks with pride at the accomplishments of 1959. Here's a brief review of what we did and, more important, a forecast of what the Oil Industry can expect as further product and service developments from Ethyl during 1960.

Antiknock compound development

1959 We introduced "Ethyl" Motor 33 Mix, incorporating manganese, which opened the door to higher antiknock quality and possible reduced octane improvement costs. In many cases, Motor 33 Mix increases refinery flexibility by permitting the use of more natural gasoline and straight-run naphtha to improve road performance. And gasoline yield can be improved by reducing reformer severity.

In addition to this continued work to improve antiknock compound formulation, the recent raising of the tetraethyllead limit to 4 ml/gal is proving advantageous. Refiners are finding that the fourth milliliter is giving them greater flexibility, lower operating costs, potential savings in capital investment, and better road performance in their gasolines.

1960 We will continue our research work directed toward the development of new antiknock compounds and promoters that will further reduce octane improvement cost. Our research in organometallics offers the promise of additional antiknock compounds to supplement existing ones now being offered to the industry.

Phosphorus additives

1959 Our third phosphorus additive—"Ethyl" Ignition Control Compound #3—was introduced, offering important advantages over previously available phosphorus compounds in terms of cost and effectiveness.

1960 An additional phosphorus additive—ICC #4—will be added to the Ethyl line. This new compound will enable refiners to add preignition protection to their gasolines at a substantially lower cost than ever before.

New antioxidants

1959 Refiners found that several new "Ethyl" antioxidants

—especially 702, 703, and 733—resulted in cost reductions and greater effectiveness.

1960 From Ethyl's ortho-alkylation reaction will come a variety of new antioxidants for many petroleum products and also important new chemical intermediates.

Expanded product service

1959 Numerous improvements in TEL unloading methods and equipment resulted in better efficiency, lower manpower requirements, and reduced costs.

The motion pictures "Danger! Water!" and "Refinery Fire on Signal Hill"—produced by Ethyl with the cooperation of the industry—were used extensively by refinery operating and safety departments in training work.

1960 A new multi-component blending system will be introduced which will cut refinery operating costs. It is completely automatic and can be applied to all refinery stocks and additives. Another cost-saving advance will be the introduction of a vacuum pump system to further speed up unloading operations. It is particularly effective where high altitude or high temperature conditions prevail.

A new training film on the hazards of air in refinery operation is being produced for release later in the year.

Market data reports

1959 Further improvement in Ethyl's monthly market data reports—retail gasoline sales in metropolitan areas, sales by states by grade, and the gasoline quality survey—was carried out to increase their usefulness in market analysis.

1960 The reports on gasoline sales by states will be expanded to include jet fuels as well as aviation gasoline, and data on the two new states—Hawaii and Alaska—will be added. We are also planning further refinements in the metropolitan area reports and, in addition, are studying the possibility of reporting heating oil sales.

Market expansion program

1959 For the fifth year, Ethyl sponsored its "Drive More" advertising program, designed to attack one of the industry's major problems—selling surplus gasoline stocks.

1960 A broader and still more effective market expansion program is getting under way.

The "Magic Circle" advertising will be strengthened by taking advantage of regional editions of national magazines with regionalized appeals. And there will be localized advertising in Sunday supplements of newspapers across the country.

Ethyl's publicity effort in behalf of more pleasure driving will be extended. Coverage of the weekly travel feature, now running in more than 150 major newspapers, will be expanded to more dailies and also to more than 500 smaller-town weeklies. In addition, the same type of material will be made available to radio and television stations across the country.

Improved offshore delivery

1959 Ethyl's continuing effort to improve all forms of delivery and make them more efficient, resulted in development of —and the first shipment by—the Sea-Land delivery system which is saving time and money for some offshore customers.

1960 Development work aimed at extending this service to customers in other areas where deliveries depend on overwater service will be continued, together with improvements in containers.

New organometallics

1959 Both the Petroleum and Chemical Industries found new applications for Ethyl's new organometallic compounds in catalysts and as chemical intermediates. The list of commercially available aluminum alkyls and alkyl aluminum derivatives from our new facilities at Orangeburg, S. C., continued to grow. Some of these products are available only from Ethyl.

1960 Important new organometallics will be introduced, including a rocket fuel additive and a rocket fuel igniter.

• • •

It's time to close the books on 1959 and get on with the 1960 job—to develop better products and services for the Oil Industry. As in the past, you can expect progress in antiknocks and additives to come from Ethyl.

ETHYL CORPORATION, NEW YORK 17, N. Y. • TULSA • CHICAGO • LOS ANGELES
ETHYL CORPORATION OF CANADA LIMITED, TORONTO • **ETHYL USA (EXPORT)** NEW YORK 17, N. Y.

BRITISH BORNEO*

EXPLORATION: Shell's exploration in 1959 was very limited until arrival in 1959 of the "Explorer," a mobile offshore drilling platform.

Probable locations of future wells are Cochrane Bank, 25 miles off the coast of Sarawak; Ampa Patches, 25 miles off the coast of Brunei (one well already drilled from a fixed platform, but another may be drilled by the "Explorer"); and Semarang Bank, about 30 miles northwest of Labuan Island. Shell also proposes to drill a medium-depth test on Mangalum Island, North Borneo.

In May 1958, Shell was granted a 10-year exploration concession covering all open marine areas west of Kudat peninsula.

At Jerudong, eight wells have been drilled, but the formation is so broken up that only one 300 b/d well was brought into production. This area so far has been extremely disappointing.

Within Seria oil field, a deep test well, drilled to 10,485 ft, penetrated sands below any previously known in Seria, but encountered only salt water.

In Miri oil field, three wells were drilled in 1958, and a fourth in 1959. The results so far have been disappointing. Some faulting was discovered, but only minor oil traps.

Best oil prospects at present appear to be in the Neogene portion of the northwestern Borneo basin, including offshore.

Reserves: Oil reserves in British Borneo at the end of 1959, assuming normal production declines, are estimated at not less than 300 million barrels.

REFINING: A simple refinery with a shipping terminal at Lutong has a daily intake capacity of 45,000 bbl of crude and 2,300 bbl of natural gasoline.

MARKETING: The series of worldwide crude price reductions made a full circle, with a drop of 18 cents per barrel on a posting by Sarawak/Shell Oilfields which cut the price on 37-gravity Seria crude to $2.57 per barrel.

PRODUCTION: The crude oils produced in Sarawak and Brunei are generally classified in four main groups: *Miri non-waxy:* About four-fifths of Miri's production, from oil sands ranging in depths from 300 ft to 3,000 ft. All processed at Lutong refinery; gasoline yield is approximately 15%. *Miri waxy:* About one-fifth of Miri's production, from oil sands lying below the non-waxy oils. All processed at Lutong refinery; gasoline yield is 45%. *Seria heavy:* About one-tenth of Seria's production. This is a non-waxy oil, produced from the shallower oil sands down to approximately 3,500 ft. Seria heavy crude is all processed at Lutong refinery. It yields about 5% gasoline. *Seria light:* About nine-tenths of Seria's production, and all produced at Jerudong (closed at present). This is a waxy oil, produced from oil sands lying below the heavy oil, mainly between 4,000 ft and 8,000 ft. Some is processed at Lutong refinery; the balance is exported in crude form. Seria light crude yields about 33% gasoline.

TRANSPORTATION: Tankers are loaded by undersea pipelines. There are eight lines in service, delivering crude and products to four loading berths lying between 3 and 4 miles offshore, at Lutong. Tankers up to the 30,000-ton class berth at Lutong. Rate of loading varies with type and number of products, but average loading time for crude oil is 1,150 tons per hour, by two 12-in.-diameter lines. Future improvements to speed tanker turnaround time include provision of single-buoy moorings, and increasing diameter of pipelines to 20 in.

Exports go by tanker to bulk supply installations at Singapore (Pulau Bukom), Indonesia (Pladju), Japan, and western Europe. The balance of unrefined Seria light waxy crude goes to other Shell refineries in Australia, Japan, USA, United Kingdom, or western Europe. Some bunkering oil is also sold direct to ships calling at Miri.

BRITISH BORNEO—Drilling Review

Year	Wells Drilled Miri	Wells Drilled Seria	Year	Wells Drilled Miri	Wells Drilled Seria	
1910	1	0	1934	0	1	
1911	0	0	1935	0	16	
1912	2	0	1936	4	19	
1913	13	0	1937	10	18	
1914	14	0	1938	5	19	
1915	16	0	1939	3	10	
1916	12	0	1940	1	20	
1917	6	0	1941	2	29	
1918	11	0	1942	0	)	
1919	2	0	1943	0	)	
1920	6	0	1944	0	)	16*
1921	33	0	1945	0	)	
1922	27	0	1946	0	17	
1923	50	0	1947	2	21	
1924	53	0	1948	3	17	
1925	56	0	1949	2	14	
1926	49	0	1950	0	22	
1927	50	0	1951	0	31	
1928	57	1	1952	0	24	
1929	62	2	1953	1	32	
1930	38	11	1954	0	27	
1931	14	6	1955	0	35	
1932	0	5	1956	0	35	
1933	0	15	1957	0	18	
			1958	2	30	

*Wells drilled by Japanese during wartime occupation.

In Miri 180 wells in production at end of 1958; total production 1,200 b/d. In Seria approximately 300 wells in production at end 1958; 45% flowing, 45% on artificial lift, 10% pumping. Total production about 110,00 b/d.

Other: Drilling by Shell in British Borneo outside Miri and Seria listed above was as follows:

1911-20:	16	1941-50:	0
1921-30:	13	1951:	2
1931-40:	14	1952:	5
1953:	5	1956:	8
1954:	4	1957:	2
1955:	10	1958:	1

OIL LAWS

The principal regulatory legislation is as follows: **Brunei:** The Oil Mining Enactment, 1951, Chap. 43. **Sarawak:** The Oil Mining Ordinance, 1958.

NATIONAL FACTORS

British Borneo consists of three territories—the colonies of Sarawak and North Borneo, and the protectorate of Brunei.

Sarawak has an annual revenue of about $50½ million Straits dollars ($3 Straits equals $1 US). About one-third to one-half of this revenue is derived directly or indirectly from oil. Sarawak's own oil production is small (65,906 long tons in 1957 from the declining field at Miri, northern Sarawak); but all the oil from Seria field, in nearby Brunei state, passes through the Lutong refinery, near Miri, northern Sarawak, for processing and/or export.

Brunei has an annual revenue of about Straits $120 million (Straits $3 = US $1). About 90% of this revenue is derived directly or indirectly from oil royalties, taxes, mining and other rents, etc. Brunei, a hitherto backward State, is financing a five-year development and modernization program entirely from a portion of its oil revenues. An indirect benefit to the population of Brunei is that the State remains one of the few places in the world where there is no personal income tax.

North Borneo (total about 30,000 square miles) has at present no revenue from oil. The sole oil operator there is Shell Co. of North Borneo, which holds leases over large land areas and almost all the continental shelf. Wildcats on land have produced no oil, however.

BRITISH BORNEO—Summary of Oil-Field Data
(As of January 21, 1959)

	Miri	Seria
Approximate size in miles	6x2	8x1½
First well drilled	1910	1929
Number of wells drilled	609	505
Shallowest producing level, ft	158	1,059
Deepest producing level, ft	3,446	8,256
Maximum depth drilled, ft	8,911	10,485
Number of wells producing oil	160	323
Average daily oil production, barrels	1,100	110,000
Cumulative production, barrels	75,150,000	449,000,000

BRITISH BORNEO—Exploration in 1959

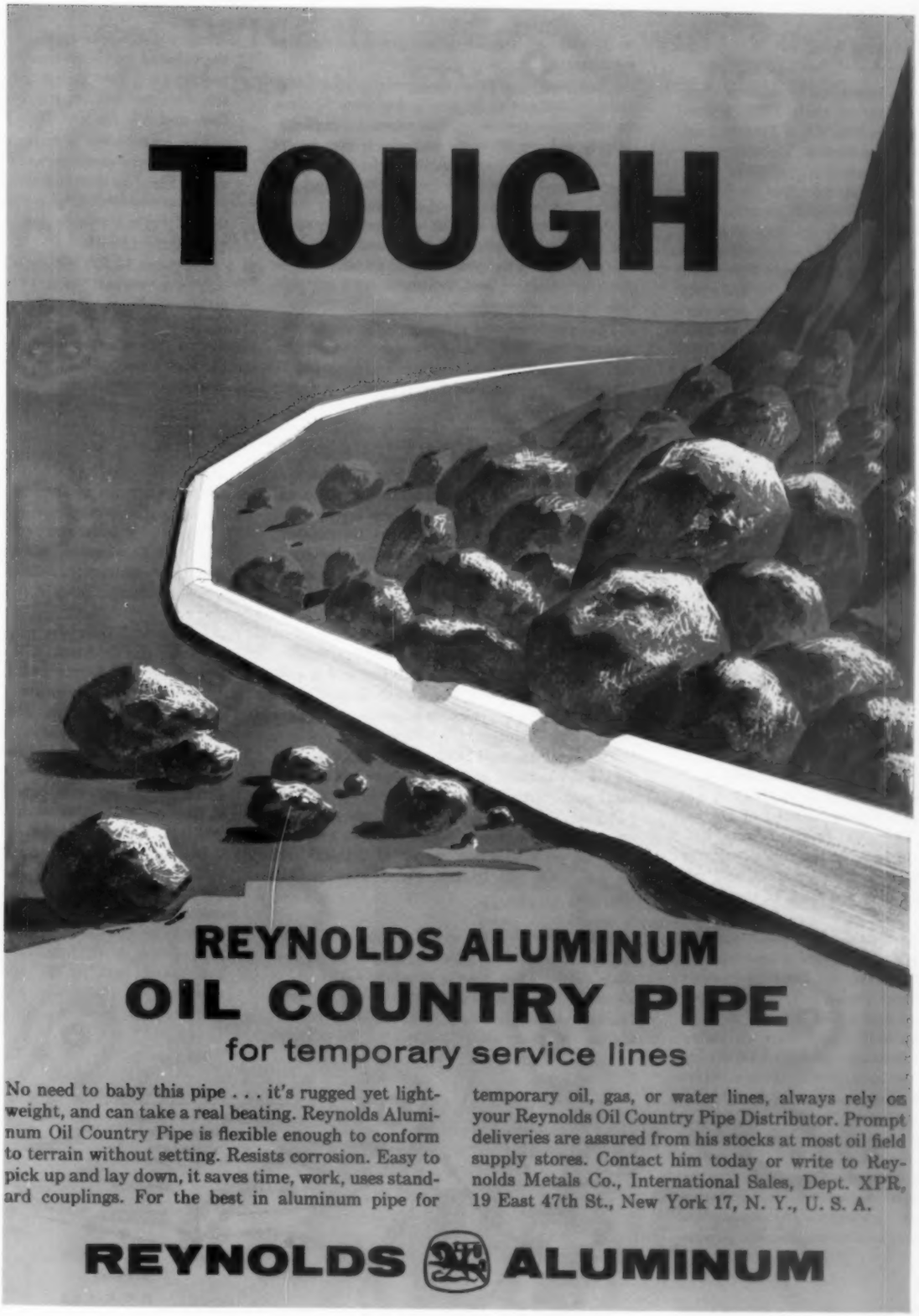
	BSP (Brunei)	SSOL (Sarawak)	SCNB (North Borneo)
Geological field party-months	5	6½	½
Gravity field party-months	—	—	½
Exploration drilling, land: string-months	3½ (one well)	3½ (one well)	2 (one well)
Exploration drilling, marine: string-months (incl. offshore Seria appraisal drilling)	4	½	—

*British Borneo includes three territories: the colonies of Sarawak and North Borneo; and the independent sultanate of Brunei, which is a British protectorate. Royal Dutch/Shell have a subsidiary company operating in each state: Sarawak Shell Oilfields Ltd., Shell Co. of North Borneo Ltd., and Brunei Shell Petroleum Co. Ltd. Activities are planned and coordinated from the central head office in Seria oil field, Brunei.

NEW CALEDONIA

Exploration in New Caledonia has been given up, and prospects are termed "somewhat discauraging" by Ste. de Réchèrche et d'Exploitation de Pétrole en Nouvelle-Caledonie.

Consumption in 1959 was estimated at about 1957 levels, but was not generally expected to show much progress due to the slowdown in the nickel industry and in the completion of the Yate Dam.



REYNOLDS ALUMINUM

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for temporary service lines

No need to baby this pipe . . . it's rugged yet lightweight, and can take a real beating. Reynolds Aluminum Oil Country Pipe is flexible enough to conform to terrain without setting. Resists corrosion. Easy to pick up and lay down, it saves time, work, uses standard couplings. For the best in aluminum pipe for temporary oil, gas, or water lines, always rely on your Reynolds Oil Country Pipe Distributor. Prompt deliveries are assured from his stocks at most oil field supply stores. Contact him today or write to Reynolds Metals Co., International Sales, Dept. XPR, 19 East 47th St., New York 17, N. Y., U. S. A.

REYNOLDS ALUMINUM

CEYLON

EXPLORATION: No exploration is known to be in progress within the country. A four-company USA-British group is renewing its offer to build a refinery at Colombo. But the group—Caltex, Standard-Vacuum, Royal Dutch/Shell, and British Petroleum—still wants a 25-year guarantee against nationalization, chief stumbling block in past negotiations.

LAOS

No exploration is known to have been done in Laos. However, during early 1959, a concession was granted to SEEMI, a French firm, for exploration near the capital, Vientiane, and in the region of Savannakhet. SEEMI (Ste. d'Etudes et d'Exploitations Minières de l'Indochine) was granted two research permits, each for five years, during which the firm must invest one billion and ninety million French francs in specified activities. Work began in November 1959. Permits are renewable twice for five years each time. 20% of the capital of the new corporation is reserved for Lao nationals for subscription within a two-month period. If Lao nationals do not take all of it, the corporation must complete the subscription in France. 10% of the capital is to be given gratis to the Lao government.

Upon discovery of a commercially productive product, defined as 50 tons a day over 30 days, the company must seek a concession for exploitation, to run for 40 years and which may be renewed. The company has the right to sell and export production, at international market prices, after satisfying local demand first. Sales to the government will be at a price equal to the firm's selling price on long- and short-term contracts during the preceding 12 months. Transportation, storage, and treatment costs are payable by the government.

The government's share is 50% of the net profits. The firm is subject to the usual taxes, duties, and other fiscal charges, and is to pay 20 kip per year (or fraction thereof) for each square kilometer of concession. Royalty is 12.5% on the value of extracted products when the annual production is two million tons or more, 10% for less than two million, 8% for less than one million, and 4% for less than 500,000 tons.,

The corporation is free to dispose of its foreign-exchange earnings whether from capital or sales. The Lao government guarantees the corporation availability of foreign exchange, other than French francs or kip, for its imports and other requirements.

Laos uses 32,330,000 liters of petroleum products in a "normal" year. This includes 12,500,000 liters of motor gasoline, some 6,600,000 liters of 100/130 aviation gasoline, about 4,400,000 liters a year of automotive diesel, some 4,200,000 liters of industrial diesel, and about 3,500,000 liters of kerosine. Lube and grease use is 550,000.

INDIA

EXPLORATION: Two private companies, Standard Vacuum Oil Co. and Assam Oil Co., are exploring. Standard Vacuum has drilled a number of deep exploratory wells (see map) without success. In November, 1959 the government liberalized oil regulation and increased exploratory activity is expected to result.

Activities of Assam Oil Co.:* Oil operations in Assam by Assam Oil Co. (Burmah Oil Co. subsidiary) concentrated in 1959 on further development of Nahorkatiya and Moran oil areas where wells completed total about 60. Production from the Digboi field by Assam Oil was at approximately the same level as in 1958. It was all fed to the Assam Oil Co. refined at Digboi.

On February 1959, Oil India Private Ltd. was incorporated in India as the rupee company to operate the new Assam valley areas, and this company then took over the assets of the Assam Oil Co. in those areas.

In 1958 the Digboi field (discovered in 1890) continued as the only established producing field in India. Good progress was made in further exploratory and development drilling in the new oil areas of Nahorkatiya (discovered in mid-1953) and Moran in the Brahmaputra valley. These areas are estimated capable of producing 2½ million tons per annum (50,000 b/d) from a total of 48 wells of an average depth of 10,000 ft completed as of the end of 1958.

Agreement was reached in 1958 between the government and the Burmah Oil Co. regarding a rupee company to develop the new oil areas. In this new concern, named Oil India Private Ltd., Burmah Oil (owners of the Assam Oil Co. Ltd.) has a 2/3 interest and the government of India 1/3. Oil India Private Ltd. will undertake the production of oil in the new areas (at the present time the wells are largely shut in) and provide pipeline facilities to transport the crude to two new projected refineries which the government will build, own, and operate through the recently formed State refinery entity, Indian Refineries Ltd.

Government Exploration: The Oil and Natural Gas Commission of India began drilling operations in 1957, utilizing Russian and Romanian rigs (see *World Petroleum Report 1957 and 1958* for description of Russian recommendations and equipment).

The government has budgeted $31.5 million for oil exploration and development during the fiscal year starting April 1, 1960.

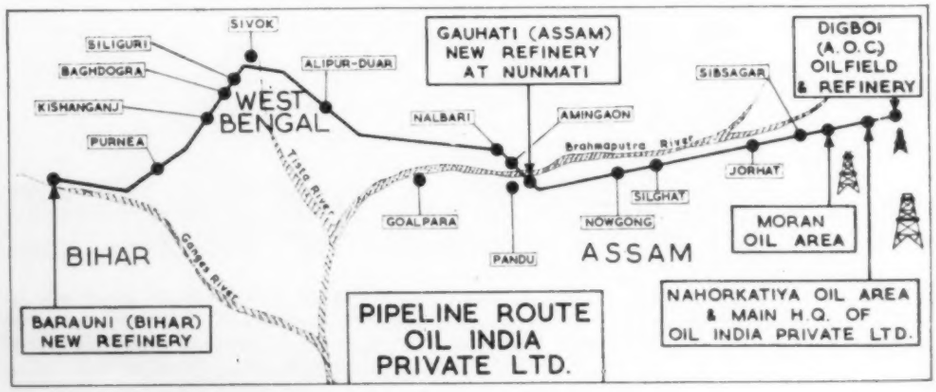
An ambitious $840 million oil development program has been proposed by the government with an oil-production target of 200,000 b/d set for 1966 for India's Third Plan period, 1961-66.

PRODUCTION: All crude production is by the Assam Oil Co., which produces from four main fields. They have a potential, all told, of about 50,000 b/d. The fields include the old Digboi field and the new Assam fields of Nahorkatiya, Moran, and Hungrijan. Production, which averaged 9,425 b/d during 1958, is expected to remain at about that level until pipeline outlets are completed.

Reserves: Proved and probable reserves in the Digboi, Nahorkatiya, Moran, and Hungrijan fields are estimated at about 300 million barrels. No estimate is available for Cambay's crude reserves.

Pipelines: Under the government's new arrangement with Assam Oil, a rupee company owned 2/3 by Assam and 1/3 by the government will build a pipeline from the new discoveries at Nahorkatiya. The line will be 16-in. from the field to Noonmati refinery to be constructed at Gauhati, a distance of about 260 miles. The second phase will be the extension of the line, using 14-in. pipe, from near Gauhati to Barauni, 460 miles to the west, where a second refinery is to be built.

During 1959, India accepted credits of £23 million ($64.4 million) offered by the Burmah Oil Co. and the British government toward the cost of the pipeline. These include £10 million offered by Burmah Oil in 1958 toward the sterling cost of the line and a further £10 million offered later by the company. The British government's share was £3 million, spent on the purchase of steel pipe, etc., in the United Kingdom.



*It is not possible to provide full statistical information about the operations in Assam, as the government classifies such details as restricted. A great deal of information about oil in India was, however, published in 1959 in the India sections of the ECAFE (UN) report "Proceedings of the Symposium on the Development of Petroleum Resources of Asia and the Far East."

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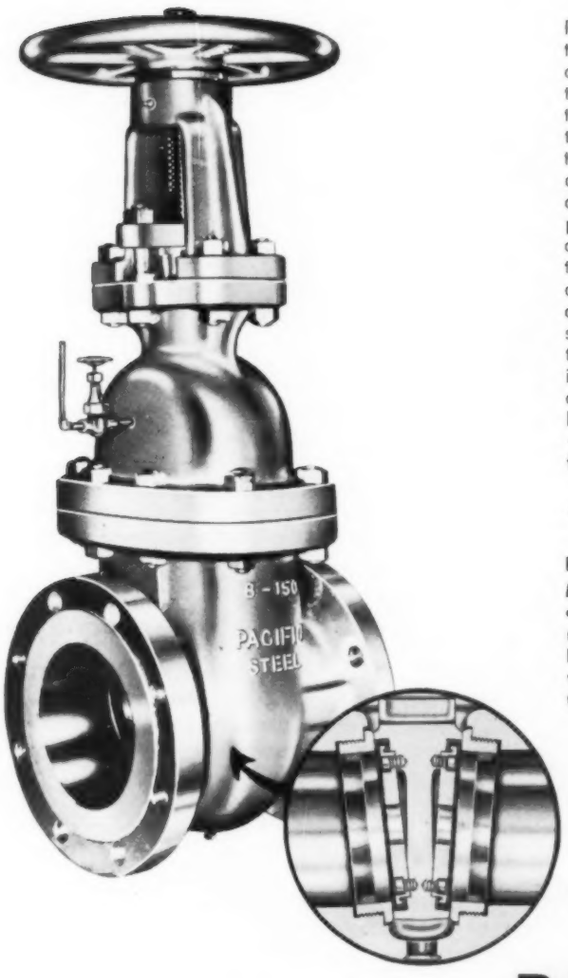

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INDIA—Estimated Supply-Demand Balance of Petroleum Products 1959-1963
(Thousands of Barrels Per Year)

	1959	1961	1963
AVGAS:			
Demand	700	550	500
Supply	—	—	890
(Shortage)/Excess	(700)	(550)	390
GASOLINE			
Demand	6,780	6,215	5,900
Supply	8,545	9,690	15,090
(Shortage)/Excess	1,765	3,480	9,190
KEROSINE			
Demand[2]	14,285	15,750	17,370
Supply	5,220	6,435	9,660
(Shortage)/Excess	(9,065)	(9,315)	(7,710)
ADO			
Demand	8,750	12,000	15,000
Supply	7,380	8,130	10,550
(Shortage)/Excess	(1,370)	(3,870)	(4,450)
IDO			
Demand	3,790	3,930	4,000
Supply	3,000	3,570	3,950
(Shortage)/Excess	(790)	(360)	(50)
FUEL OIL			
Demand—Domestic	6,070	6,750	7,430
Bunkers	2,700	2,800	2,900
Total	8,770	9,550	10,330
Supply	9,060	8,600	10,010
(Shortage)/Excess	290	(950)	(320)

REFINING: During 1959 agreement was reached, as previously described, between Assam Oil and the government, setting up Oil India Private Ltd., a company which will develop the new crude-production areas and build two refineries. The government will own the refineries, although it will only have one-third interest in Oil India.

There is no allocation in the Five-Year Plan for these plants, but they will be financed by communist loans. The first plant is to be at Gauhati, and will have a capacity of 20,000 b/d.

A second refinery of about 40,000 b/d capacity will be built at Barauni by the government. The USSR will grant India a credit of 100 million rubles (about $25 million at present official exchange rates). The amount is considerably less than the estimated cost of the refinery.

The government is setting up a marketing company to distribute products from the two new refineries under construction at Gauhati and Barauni.

MARKETING: Domestic consumption is growing rapidly, due to the forced pace of internal industrialization. Expenditures for oil imports are about $210 million yearly, and likely to rise to $231.5 million by the end of 1961. It has been estimated recently that, to meet the growth of the country's demand up to 1967, an investment of about $760 million dollars would be required—provided present costs do not rise further. The bulk of this outlay will go to meet expenditures on exploration, and additional resources will have to be found to extract, transport, and refine oil.

During 1958, an agreement reducing product prices was reached between the government and the oil companies, replacing the VSA agreement of 1948 which laid down the price formula.

OIL LAWS

During 1959 the oil laws of India, together with similar documents, were published in a series of volumes which contain the oil laws and concession contracts for the rest of Asia and Australasia as well. The publication is entitled *"Asia and Australasia—Basic Oil Laws and Concession Contracts" (Original Texts)*. It consists of a basic set of volumes containing word-for-word translations of the oil laws for countries in the Far East, with a supplementary service keeping them up to date. Other volumes cover the remainder of the world. The publication is the only one of its kind, and it is highly recommended. Requests for information should be addressed to the publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

By Notification of 24 November 1959, the government has superseded the Petroleum Concession Rules, 1949. The notification is entitled "Petroleum and Natural Gas Rules, 1959," and came into force on 25 November 1959. An important part of the new Rules is the understanding that most exploration licenses or exploitation leases will be given by negotiated agreement. Presumably such negotiations could go into far greater detail than do the new Rules and may vary appreciably from their provisions. There follows a summary of the new Rules:

EXPLORATION: Area: license area 3,000 sq. miles unless otherwise agreed (Art. 10). **Duration:** 4 years, extendable twice for one year each time (Art. 10). **Fees:** Deposit of 20 Rupees per square mile with minimum of 6,000 Rupees (Art. 11, Para. 1). **Yearly Surface Tax** (in Rupees per square mile): 10 in first year, 50 in second year, 250 in third year, 500 in fourth year, 750 in first and second year of renewal (Art. 11, para 2).
EXPLOITATION: Area: 100 sq. miles unless otherwise agreed. (No mention of how many may be held by one company) (Art. 12.) **Duration:** 20 years. (No mention of renewal or extension) (Art. 12). **Fees:** Application deposit of 20,000 Rupees with State government as security, plus deposit of 2,000 Rupees for preliminary expenses (Art. 13). **Yearly Surface Tax:** (called "dead rent") 5 Rupees per acre payable to State government for first 50 square miles and 10 per acre for remainder, with lessee liable to pay only dead rent or royalty whichever is higher, but not both (Art. 13, Para. 2 (a)). **Royalty:** 10% of gross value at well head on all crude oil, condensate or gas lost or returned to reservoir (Art. 14).

INDIA—Operating Refineries
(As of July 1, 1958)

Company	Location	Crude Capacity	Type	Cracking Capacity
Assam Oil Co.	Digboi	8,400	Comp.	1,900T
Burmah Shell Refineries	Bombay[1]	50,000	SCA	12,000C
Standard Vacuum Co. of India	Bombay[2]	32,000	Comp.	7,700C
Caltex Oil Refining (India) Ltd.	Vishaktman	14,100	S	8,000C

[1]6,700 b/d catalytic reformer, 7,300 b/d Edeleanu plant. [2]3,800 b/d thermal reforming, 250 b/d cat poly. S—Skimming; Comp.—Complete; A—Asphalt; C—Cracking. Under "Cracking" to denote type: T—Thermal; C—Catalytic.

NATIONAL FACTORS

Pushed by an explosive population growth and extreme low per-capita income, the Indian government has sought to stimulate oil exploration to meet the very rapid increase expected in oil use, which is expected to rise by not less than 7% annually.

Oil currently supplies about 3% of the total energy requirements of India, including commercial and noncommercial energy (which covers animate energy), according to the government, on November 28, 1958.

During 1959, an American consultant, Walter J. Levy, was invited to report on India's oil problem. His basic recommendation was that the country's oil problem is too large for the government to solve alone and that private capital should be admitted to help solve it. Since has occurred the liberalization of the oil laws. However, there remains the oil nationalization clause (see *World Petroleum Report 1957*), which permits expropriation of oil development and exploration holdings and the government's insistence on owning a majority share of new companies. This ownership does not, however, extend back to refining companies in India which were established before the requirement. Standard Vacuum's refinery at Bombay, for example, is 100% owned by the company.

Oil marketing within the country will eventually have to be State-controlled, according to a recent statement by Prime Minister Nehru. He stated the government "would have to come to some agreement with the distributing companies."

INDONESIA

EXPLORATION: Despite a perennial Asian oil shortage and Indonesia's need for increased revenues, new exploration in Indonesia virtually had been at a standstill for some years due to the turbulent political situation. However, after several years of no exploratory drilling activity, Standard Vacuum Oil Co. resumed wildcat drilling in Central Sumatra in 1959. First test, spudded in July, came in for about 1,680 b/d.

During 1959 (to October) Stanvac completed seven exploratory wells in Indonesia, averaging 2,300 ft (one producer, six dry)—with nine completions estimated for the balance of the year. Stanvac's development drilling to October 1959 (depths averaging 1,800 ft) resulted in 21 completions (14 producers, seven dry); estimate for balance of 1959, 10 completions.

Neither of the two offers to explore in Indonesia made in 1958—one by Asamera Oil Co. (Canadian) and the other by Petroleum Development Resources Corp. (Japanese)— has been accepted.

On May 2, 1959, Permina announced discovery of a new well, with a potential of 630 b/d, at Kenali Asam, near Djambi in South Sumatra. (For earlier exploration activity in Indonesia, see *World Petroleum 1958 and 1957*).

PRODUCTION: Crude production in Indonesia is estimated at 345,000 b/d for 1959. Most active company has been Caltex, with a big investment program (see *World Petroleum Report 1958*). The Caltex shipping terminal at Dumai, on the east coast of Sumatra, was opened in mid-1958. A 30-mile 30-in. pipeline connects the terminal with Duri field, where 22 API gravity crude was discovered in 1940. The field had been shut in.

Early in 1959 BPM (Dutch/Shell) announced a $50 million program to link Borneo's shut-in Tandjun field (discovered in 1938 in southern Kalimantan) with the Balikpapan coastal refinery. To begin operation early in 1962, the 161-mile 20-in. pipeline's 40,000 b/d initial capacity is to rise gradually to 65,000 b/d. The program comprehends drilling 30

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more field wells. One well drilled at Tandjung during 1958 brought total there to 32 in that year.

REFINING AND MARKETING: Crude capacity of Indonesia's six refineries was 259,800 b/d as of mid-1959—expected to remain at this level through 1963.

Consumption: Indonesian consumption of oil products in 1959 was expected to approximate 26 million barrels (about 71,233 b/d)—including international bunkers. With normal supply and demand forces distorted by inflation and government controls, a forecast of growth is conjectural. With economic recovery, a 9% annual growth factor over the next five years might be anticipated.

Domestic sales of refined oil products totaled 24,870,000 bbl (68,137 b/d) in 1958, down from 25,319,000 in 1957. Sales of kerosine in 1958 came to 8,145,775 bbl, up from 7,478,254 in 1957. Sales of regular gasoline were 5,802,391 bbl in 1958, up from 5,367,369 in 1957.

Increasing domestic demand for gasoline and kerosine prompted the government, late in 1958, to request Caltex to refine its crude locally. Caltex has been exporting all of its output for lack of a refinery.

The State-controlled Permina was reported, in May 1959, selling 81% of its output to the Refinery Assn. of California. At least one shipment of 13,250 bbl of crude from North Sumatra is said to have been delivered to Japan during June 1958—with additional shipments possible.

INDONESIA—Oil Refineries
(As of July 1959)

COMPANY	PLANT LOCATION	CRUDE CAPACITY (Barrels Per Day)	CRACKING CAPACITY
BPM	Balikpapan—Borneo	65,000	5,300A
	Pladju—South Sumatra	110,000	25,000T 400P
	Tiepu—Central Sumatra	4,600	
	Wonokromo—East Java	3,200	
Indonesian govt.	Pangkalan, Brandan—North Sumatra	2,000	
Standard Vacuum Pet. Mij.	Sungei Gerong—South Sumatra	75,000	34,000T; 10,000CR; 1,200P; 800A

Under Cracking Capacity: A—Alkylation. T—Thermal. P—Poly. CR—Cracking Reforming.

Note: Capacity of these six refineries is expected to remain at 1959 level through 1963.

OIL LAWS

Controlling Statutes: The basic legislation under which the oil industry now is operating is the old mining law of 1890 (which has been translated and is kept on file at the offices of *World Petroleum Report*). Though operators are still subject to it, the law now is nearly defunct; and no new concessions have been granted under it since 1951 (*see WPR 1958*, p. 233, for the law's provisions).

A long-awaited draft of a proposed new oil law, and of a new mining law, appeared during 1959. Though both had cabinet approval and had been submitted and resubmitted several times to the parliament, the bills were withdrawn pending review by President Sukarno. With Sukarno's recent decree establishing himself virtual dictator, all new legislation must await his approval (see NATIONAL FACTORS below). The proposed oil bill was vague and unfavorable to international investors.

Also unfavorable to international investors is a foreign capital investment act. It too awaits review by President Sukarno.

NATIONAL FACTORS

During 1959 Indonesian President Sukarno issued a decree giving himself full executive power over the island republic, in the name of "guided democracy."

Regionalism, religion, and communism have been major problems in politically plagued Indonesia. In 1958, Java elections showed an increase in communist strength everywhere. With 75% of the population in Java, regionalism has manifested itself in repeated coups on the outer islands of Indonesia. The religious problem—with 90% Moslem population split about 50-50 orthodox-unorthodox—only aggravates the situation.

There has been no change in the level of taxation as reported in *World Petroleum Report 1957*. The unit of currency, the rupiah, was devalued at 45 per US dollar, official rate, as of August 25, 1959. This devaluation probably resulted from the fact that the former official rate of 11.42 was rarely used; instead a series of multiple exchange rates existed, fluctuating as high as 41 to the US dollar.

JAPAN

EXPLORATION: Activities during 1959 were highlighted by the discovery of a new offshore field, off Niigata prefecture in northern Japan, by Teikoku Oil Co. which the company calls the second largest field in the country. The discovery well flowed about 10 to 20 kiloliters daily (around 75 b/d to 150 b/d), with some gas which is expected to increase to some 500,000 cubic meters daily. It is believed the new field will have about half the capacity of Japan's largest field at Yabase, Akita prefecture. Pay zone was about 1,775 to 1,908 ft. Total depth is 4,760 ft. and from one-fourth to one-half mile wide.

Teikoku will concentrate on oil production rather than natural gas, although the discovery well struck oil while the company was boring for gas. Test wells in other fields were suspended temporarily for a test program of 10 wells in the new field in November 1959.

Teikoku also plans an *in situ* combustion program for a large number of shut-in or marginal fields, hoping eventually to recover more than 70 million barrels from such fields as Hachimori and Chokai.

The best single well in the postwar era for Japan was drilled in 1959 in a new pool in the Sarakawa field in northern Honshu. Japan Petroleum Exploration Co. completed well S.K. 6 with initial production of 440 b/d of 33-gravity crude through a ¼-in. choke. Output came from a 56-ft section topped at 3,986 ft. Tubing pressure was 667 psi, and gas-oil ratio 100:1. The best producing wells in the country, in Yabase field, average 126 b/d.

PRODUCTION AND RESERVES: Crude-oil production had risen 13% in 1958 over 1957, to a daily average of 7,021 bbl. In 1959, production was an estimated 7,100 b/d. Natural gas had a much bigger increase in 1958 than did crude, 51% over 1957, rising t oan average of 35,580 mcf per day. Proved reserves of crude oil in 1958 were 4,410,000 kiloliters (27.8 million barrels).

REFINING AND PETROCHEMICALS: Japanese refining capacity, about 555,000 b/d at present, is expected to rise well over a million barrels daily by 1975. Forecasts range from 1.3 million to more than 2 million.

Mitsubishi Oil has submitted construction plans for a 20,000 b/d refinery to the government. Completion is scheduled for March 1961.

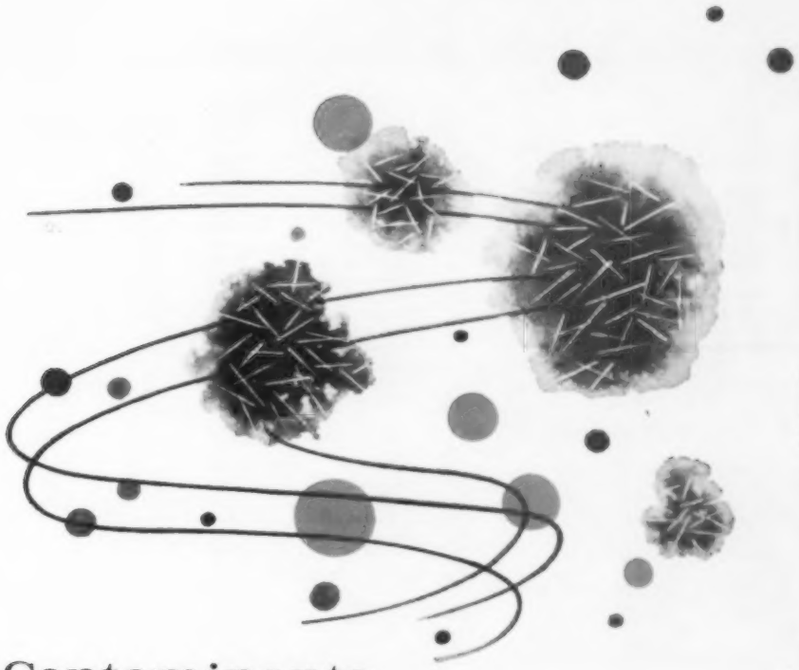
One new refining company had been scheduled to start building a 35,000 b/d refinery at Kawasaki during 1959. The new firm is a joint enterprise of General Bussan and Toa Nenryo Kaisha.

Kawasaki, on the bay between Tokyo and Yokohama, is growing rapidly as the nation's major processing center. Eventually, about one-third of Japan's refining capacity will be located there, with four companies slated to build. Besides General Bussan—mentioned above—Toa Nenryo Kogyo is building 100,000 b/d of capacity; Nippon Gyomo planned 20,000 b/d by 1959; and Idemitsu Kosan expects to put 50,000 b/d onstream by 1962—including 15,000 b/d of catalytic cracking and 5,000 b/d of catalytic reforming.

A large petrochemical complex involving several companies and an investment of about $70 million is reaching completion at Kawasaki also, across the channel from the refining center. Nippon Petrochemical Co. has begun start-up operations, receiving naphtha from the Yokohama refinery of Nippon Petroleum, eight miles away, to produce ethylene, propylene, butadiene, by-product gases, and benzene. Furukawa Chemical is using the ethylene to make polyethylene and copolymer plastic in a plant in Tokyo with an ultimate capacity of 20 million pounds per year, once full commercial operations are under way. It is the world's first plant to use the Standard Oil Co. (Indiana) low-pressure process.

Maruzen Oil Co. Ltd. established a $6.9 million petrochemical affiliate near the end of 1959, with headquarters in Osaka, and will build a plant at Matsuyama to manufacture secondary butanol and methyl ethyl ketone, with an annual capacity of nearly 1.2 million pounds. Sumitomo Chemical Co. Ltd. has concluded an agreement with Société Bèlge de l'Azote et des Produits Chemiques du Marly (SBA), of Liège, Belgium, for the design and construction of a large plant at Niihama city to produce acetylene and ethylene from liquid hydrocarbons.

Japanese Synthetic Rubber Co. Ltd. is building a 25,000-ton-per-year Houdry butane dehydrogenation unit in Yokkaichi, part of an integrated facility which will have an eventual



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JAPAN—Petroleum Refining Facilities
(Barrels Per Stream Day)

	Refinery	Crude Thruput Capacity	Thermal Cracking	Catalytic Cracking	Catalytic Reforming	Alkylation & Polymerization	Solvent Dewaxing	Solvent Extraction	Solvent Deasphalting
Nippon Pet. Ref Co., Ltd.	Yokohama	46,000	—	5,600(1)	3,300(6)	—	3,400(11)	1,080(15)	3,500(18)
"	Kudamatsu	26,500	—	—	1,500(5)	—	760(11)	400(15)	—
Showa Oil Co., Ltd.	Kawasaki	27,000	—	—	1,500(5)	—	500(12)	1,000(16)	—
Showa Yokkaichi Sekiyu Co., Ltd.	Yokkaichi	40,000	—	12,000(2)	—	—	—	—	—
Toa Nenryo Kogyo K.K.	Wakayama	57,000	—	10,200(1)	4,700(7)	1,250(9)	1,120(13)	1,720(17)	660(18)
"	Shimizu*	43,500	—	—	—	—	660(11)	—	—
Maruzen Oil Co., Ltd.	Shimotsu	37,500	—	3,000(3)	—	—	750(11)	1,000(16)	—
"	Matsuyama	10,000	—	—	3,000(5)	—	—	—	—
Mitsubishi Oil Co., Ltd.	Kawasaki	61,400	3,000	—	4,500(5)	—	600(14)	430(15)	—
Koa Oil Co., Ltd.	Marifu	35,700	3,000	—	3,300(5)	—	—	—	—
Daikyo Oil Co., Ltd.	Yokkaichi	25,000	—	3,500(4)	3,000(8)	218(10)	600(11)	700(15)	—
Idemitsu Kosan Co., Ltd.	Tokuyama	45,000	—	7,000(3)	3,000(5)	—	—	—	—
Asia Sekiyu Co., Ltd.	Yokohama	13,000	—	—	1,300(6)	—	—	—	—
Toa Oil Co., Ltd.	Kawasaki	12,000	—	—	—	—	—	—	—
Taiyo Oil Co., Ltd.	Kameoka	5,000	—	—	—	—	—	—	—
Total of Pacific Coast Refineries		484,600	6,000	41,300	29,100	1,250(9) 218(10)	8,390	6,330	4,160
Nippon Oil Co., Ltd.	Akita	4,000	1,000	—	—	—	—	—	—
"	Niigata	7,500	—	—	1,600(5)	—	—	—	—
"	Kashiwazaki	1,500	—	—	—	—	—	—	—
Showa Oil Co., Ltd.	Hirasawa	3,000	—	—	—	—	—	—	—
"	Niigata	11,000	—	—	—	—	—	—	—
Nippon Mining Co., Ltd.	Funakawa	19,350	—	—	—	—	600(11)	500(15)	—
Total of Japan Sea Coast Refineries		46,350	1,000	—	1,600	—	600	500	—
Nippon Pet. Ref. Co., Ltd.	Muroran	10,000	—	—	—	—	—	—	—
North Japan Oil Co., Ltd.	Hakodate	12,000	—	—	—	—	—	—	—
Total of Refineries in Hokkaido		22,000	—	—	—	—	—	—	—
Total of Japan		552,950	7,000	41,300	30,700	1,250(9) 218(10)	8,990	6,830	4,160

(1) ER & E Model IV unit
(2) Shell type unit
(3) U. O. P. type unit
(4) Houdriflow type unit
(5) Platformer
(6) Unifiner-Platformer
(7) Fluid Hydroformer
(8) Houdriformer
(9) Alkylation unit
(10) Polymerization unit
(11) B. K. dewaxing unit
(12) Bari-sol dewaxing unit
(13) Propane dewaxing unit
(14) M. E. K. Toluene dewaxing unit
(15) Furfural extraction unit
(16) Duo-sol extraction unit
(17) Phenol extraction unit
(18) Propane deasphalting unit

*Some of the units are temporarily rented to General Bussan Kaisha, Ltd.

capacity of 45,000 tons per year. Completion was planned for 1959.

IMPORTS, EXPORTS, CONSUMPTION: Japan depends heavily upon the Middle East for crude oil. Imports from these sources in 1958 came to 13.8 million kiloliters, almost 85% of total imports.

Domestic consumption of products rose about 5.6% in 1958 over 1957, to a total of 16.23 million kiloliters, an average of 280,000 b/d. Gasoline consumption rose 11.2%, to a daily average of some 69,000 bbl; however, largest consumption continued to be in heavy fuel oil, 155,000 b/d.

TRANSPORTATION: Since the country's primary concern is to bring in sufficient foreign crude to meet domestic needs, the biggest problem is to develop proper harbor facilities to berth the largest new tankers. A six-year port-expansion program is under way. At present, only Yokohama harbor and Shimotsu harbor in Wakayama prefecture are capable of taking care of supertankers in the 20,000- to 30,000-ton class. There are no harbors which can accommodate vessels of the 35,000-ton and higher class.

Four large industrial groups are now working on atomic-powered tankers, with designs being developed for ships ranging from 65,000 to 80,000 tons.

Internal transportation is primarily by tank cars. Latest data available, for the end of 1957, show a total of 640.7 kilometers of crude pipelines and 1,003.7 kilometers of natural-gas lines, all of small diameter—16-in. and less. Two projects in the planning stage are for natural-gas lines for a total of some 160 kilometers.

OIL LAWS

Controlling Statutes include: the Mining Law (No. 289) of December 20, 1950; the Petroleum and Inflammable Natural-Gas Resources Development Law (Decree 162 of 1952, Decree 276 of 1952, Decree 88 of 1954). For a review of the provisions of these laws, see *World Petroleum Report 1958*.

NATIONAL FACTORS

Japan continues to strengthen its relations with the Middle East countries, particularly Kuwait, Saudi Arabia, and Egypt. It needs access to a primary source of crude oil, since about 97.6% of its requirements must be imported.

Another group of Japanese companies has made an offer to Indonesia's State-owned Permina Oil Co. to rehabilitate and develop wells in North Sumatra on credit terms.

Maruzen Oil Co. and Union Oil Co. of California have set up a joint $10 million venture, to be named Unima, for investment in development in the Celebes, refinery construction in Thailand and Malaya, and product sales throughout southeast Asia, Australia, and New Zealand.

JAPAN—Estimated Demand for Petroleum Products
(Thousands of Kiloliters)

	1956	Index	1962	Index	1975	Index
Gasoline	3,375	100	6,788	200	20,919	620
(%)	(27.2)		(27.2)		(31.8)	
Jet fuel	27	100	458	1,700	1,470	5,430
(%)	(0.2)		(1.9)		(2.2)	
Kerosine	775	100	1,211	156	2,353	304
(%)	(6.2)		(4.8)		(3.6)	
Gas oil	955	100	2,129	224	5,578	582
(%)	(7.7)		(8.5)		(8.5)	
Fuel oil	7,277	100	14,370	198	35,420	486
(%)	(58.7)		(57.6)		(53.0)	
Total	12,409	100	24,956	202	65,740	506
(%)	(100.0)		(100.0)		(100.0)	

Figures are as of fiscal year.
Source: Economic Planning Board.

JAPAN—Extrapolation and Percentage Distribution of Energy Use, 1950-1975

Year	Coal %	Petroleum %	Natural Gas %	Hydroelectric Power %	Total 10⁹ Kcal	%
1950	57.1	6.9	0.1	35.9	442,211	100.0
1956	48.2	20.5	0.2	31.1	711,328	100.0
1962	46.3	26.8	1.1	25.8	1,074,969	100.0
1975	35.3	41.4	1.3	22.0	1,848,420	100.0

Figures are as of fiscal year. 1962, 1975, estimated.

VIETNAM

There is no exploration or production within the country. All petroleum needs are imported, 95% of them coming from Indonesia. Imports of petroleum products increased by 10% in 1958, to about 430,200 tons (around 8,600 b/d). Total consumption was increased by 12.1% in 1958, with motor-gasoline use rising 12.0%, kerosine rising 17.6%, gas oils rising 13.0%, and heavy fuel oil rising 16.4%.

NETHERLANDS NEW GUINEA

EXPLORATION: The recent discovery in Papua (see that section) has stimulated interest in New Guinea's oil prospects. There has been some production established in western New Guinea, but the fields are declining fast and their poor performance is another reason for not expecting much from future exploration.

Exploration began long ago, when an expedition was sent to the area in 1905 by Royal Dutch; but New Guinea was considered too difficult for futrher work. The same verdict was reached by a second inspection in 1915. In 1935, NV Nederlandsche Nieuw Guinee Petroleum Maatschappij (NNGPM) was established, with the Royal Dutch/Shell group and Standard-Vacuum each holding a 40% interest, and Far Pacific Investments (Caltex) 20%.

Production at Klamono began in 1948, and has been steady at 1.6 million barrels a year. In 1954, Wasian and Mogoi came into production, and total output of Netherlands New Guinea then rose to about 3.4 million barrels, but it has been falling ever since. It was only 2.26 million barrels in 1957 (about 6,300 b/d), and fell to about 4,800 b/d in 1958, and continues to decline.

Klamono is a fair-sized field, but it will reach its economic limit in six to seven years. Wasian and Mogoi are now declining fast: The latter halved their output from 1,058 b/d in 1956 to 523 b/d in 1957, and are expected to reach the limit of their economic life in one or two years, when production is then likely to cease.

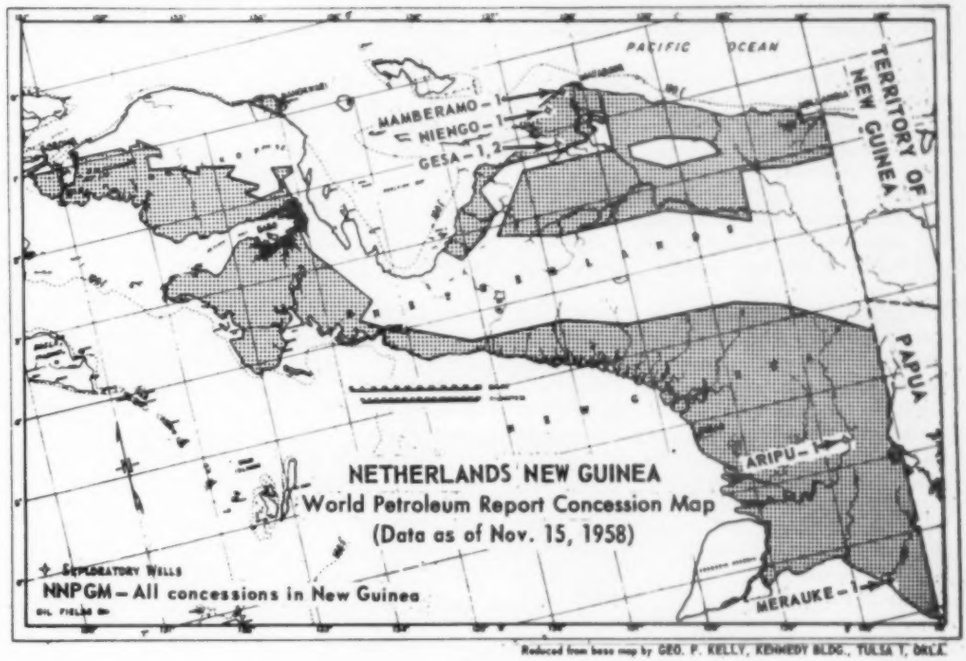
The net result of this effort has been investment of about $117 million, of which somewhat less than one-third has been recovered by the sale of oil. The companies will probably discontinue exploration if no discoveries are made in the next few years.

Two small Australian companies have also been working in eastern New Guinea. See the Papua section for a review of their activities.

WESTERN NEW GUINEA—Historical Well Drilling†

Year	Oil	Gas	Dry	Total
1958*	—	—	3	3
1957	—	—	6	6
1956	3	—	5	8
1955	5	—	13	18
1954	16	—	13	29
1953	26	—	10	36
1952	6	—	4	10
1951	7	—	3	10
1950	9	—	7	16
1949	8	—	3	11
1948	—	—	4	4
1947	—	—	—	—
1946	—	—	—	—
1945	—	—	—	—
1944	—	—	—	—
1943	—	—	—	—
1942	—	—	—	—
1941	6	—	3	9
1940	5	—	6	11
1939	3	—	3	6
1938	—	—	4	4
1937	—	—	2	2
1936	—	—	1	1
Total	94	—	90	184

*Through Oct.
†All by Nederlandsche Nieuw Guinee Petroleum Mij.



Reduced from base map by GEO. P. KELLY, KENNEDY BLDG., TULSA 3, OKLA.

OIL LAWS

NNGPM's original concession, obtained in 1936, covered 24,700,000 acres, part of which was later relinquished. In 1956, NNGPM obtained an additional 42,243,000 acres, to be combined with the old concession, the whole for a period of 75 years.

PAKISTAN

EXPLORATION: Pakistan's disappointing oil hunt received a small lift in mid-October 1959, when a well in northern West Pakistan showed encouraging signs of oil. The costly search of 1957 and 1958 continued into 1959; but several of the new tests begun in 1958 have been given up following abandonment of no less than 14 wells at various depths—a number deeper than 10,000 ft. Hunt International, among exploring companies during 1958, gave up in 1959 (except for geological and gravity work) after 11 unsuccessful wildcats. It moved its rig to Libya. The lack of success affects the Middle East oil search, particularly Iran's southern offshore area which is similar oil territory.

Eight companies exploring in Pakistan during 1958, without significant results, continued their search in 1959. They included Standard Vacuum, Sun Oil, Attock Oil, (Pakistan Oilfields Ltd.), Burmah Oil (Pakistan Petroleum Ltd.), Shell Oil, Sun Oil, and Tidewater—the latter two doing geological work only.

The 1959 discovery, Karsal No. 3, was announced on October 12 by joint partners Pakistan Petroleum Ltd. and Pakistan Oilfields Ltd. Karsal No. 3 is located 100 miles southwest of Rawalpindi and 10 miles northeast of Balkassar field (whose oil is of similar quality). 22.8 gravity oil was encountered at 11,664 ft in Eocene limestone. The well is the third deep test on the structure within the past three years. Karsal No. 1, a discovery at 12,751 ft in 1956, has had small intermittent production; and No. 2 was abandoned during 1958 at 12,676 ft. Production at No. 3 averages 14% water. Production tests (after acid treatment) indicated Karsal No. 3 is capable of a sustained output of 800 b/d to 1,000 b/d.

Natural Gas: Pakistan Petroleum Ltd., early in 1959, discovered a new natural-gas reserve at Chhatak, in the Sylhet district, 25 miles north of the company's 1955 Haripur discovery. On the basis of the discovery well, gas reserves at Chhatak are estimated at about 20 billion cubic feet. Except for a nearby cement factory, there is no immediate market for the gas. Haripur reserves now are estimated at less than the original 150 to 280 billion cubic feet estimate.

Standard Vacuum, in 1959, announced a large gas reserve in a well at Mari, 260 miles northeast of Karachi, West Pakistan, in an area where it has taken up additional acreage; flow rates have been reported at about five million cubic feet daily. Except for Mari, the company in 1959 relinquished all its land in West Pakistan.

Despite the frustrating results of Pakistan's oil search, the government recently announced new and stricter concession regulations which aim at speedier work under new grants, and stiffening of work obligations, rentals, and investment requirements (see OIL LAWS section hereinafter). Shell and Pakistan Petroleum Ltd. have obtained some new acreage in the Sylhet area, presumably under the new regulations.

PRODUCTION: Crude production continued its slow upward climb in 1958, to 6,243 b/d. Two companies, Pakistan Petroleum Ltd. and Pakistan Oilfields Ltd., accounted for the country's average 6,300 b/d in 1959. Balkassar, largest of the four producing fields, accounts for three-fourths of crude production; the three others—Dhulian, Joya Mair, and Khaur—produce the rest. The Karsal discovery should increase Pakistan's crude production in 1960.

Pakistan Petroleum Ltd. produced 4,039,895,000 cubic feet of raw natural gas from the Sui gas field, West Pakistan, and Attock (Pakistan Oilfields Ltd.) 1,116,894,000 cubic feet from the Dhulian field, in the first three months of

1959. Purified gas in the quarter came to 3,624,763,000 cubic feet from Sui; Dhulian gas requires no purification.

Gas sales from Sui reached a record 49 million cubic feet on August 31, 1959, resulting in a considerable saving in foreign exchange which otherwise would have to be paid for imported fuel. In the first half of 1959, consumption reached 7,244,666 million cubic feet sold by Sui Gas Transmission Co. Of the total, Karachi Gas Co. accounted for 4,741,041 million cubic feet and Industrial Gas for the rest.

REFINING: Negotiations begun by the Pakistan government with major oil companies in 1957 resulted in an agreement in October 1959 for the construction of a 30,000 b/d refinery at Karachi—two-thirds of the cost to be incurred in foreign currency. Completion is expected within 2½ years. Capacity later may be expanded to 40,000 b/d. Burmah Oil (Pakistan Petroleum Ltd.), Caltex, Shell, and Standard Vacuum will have a 60% interest; Pakistan, 40%. Output of the Karachi plant, plus the 5,500 b/d capacity at the country's only existing refinery at Rawalpindi, should cover all of Pakistan's requirements except aviation gasoline by 1962. Japanese and European capital also had been negotiating for the new Karachi refinery.

A small field processing unit was installed at the Sui gas field during 1958. With a capacity of 350 gallons per day of condensate, it provides Sui facilities with needed kerosine and diesel fuels.

A small petrochemicals industry is due to start in Pakistan. Two fertilizer plants, to operate on natural gas, will each produce about 250,000 tons per year when completed some time in 1960. One plant is at Multan in West Pakistan; the other at Jenchuganj, near the Sylhet gas field in East Pakistan.

PAKISTAN—Refinery Output of Oil Products
(Thousands of Imperial Gallons)

	1958	1957
Motor gasoline	21,938	21,258
Kerosine	3,682	4,418
Diesel oil	17,219	15,846
Fuel oil	24,214	24,446
Lubricants	1,485	1,334
Others	3,919	3,415
Total	72,457	70,717

MARKETING: Only 20% of domestic consumption has been produced locally; the remainder is imported. Consumption has been averaging 35,000 b/d—of which the largest segment is fuel oil.

Pakistan is studying a scheme for the liquefaction and export of natural gas. Proven reserves of gas are estimated at about nine trillion cubic feet. Natural gas from Sui has been pumped to Karachi, with estimated saving in foreign exchange of some $5.25 million in 1958-59.

TRANSPORTATION: There are no crude lines of importance in Pakistan. An extension of the 16-in. natural-gas line between Sui fields and Karachi was finished in 1958. A further extension of 130 miles beyond Multan to Lyallpur, center of the Punjab cotton-spinning industry, also has been planned.

Another natural-gas line has been proposed for East Pakistan, an 8-in. 145-mile line from the Sylhet gas field to industrial markets in Dacca; capacity, 24 million cubic feet per day without compressors. Another smaller-diameter line is planned from Sylhet northward about 25 miles to a cement plant at Chhatak.

OIL LAWS

Controlling Statutes: Principal regulation is contained in the Pakistan Petroleum (Production) Rules 1949 and subsequent amendments. For a brief summary of the provisions of Pakistan's oil legislation up to 1959, when stiffer regulations were promulgated, see *World Petroleum Report 1958*, p. 238. During 1958 all new concession grants were halted and a moratorium imposed on them.

Government notification of July 10, 1959, substantially altered fiscal requirements in exploration and exploitation. Rentals during exploration are increased about 10 times over previous levels, prospection rentals five times. The minimum work requirement during exploration also has been increased sharply. Royalty, which formerly was 12½% payable in cash, now is the same percentage payable in cash or in kind. Duration of the exploration license has been increased to four years from three, with an extension of one year only—at which time the area must be reduced by 50%.

Pakistan government rules of July 1958 on transmission, distribution, and utilization of natural gas give the government, through its Central Engineering Authority, power to supervise and regulate gas distribution and pricing.

PAKISTAN—Wells Drilled

Year	Oil	Gas	Dry	Total	Remarks
1947	—	—	1	1	
1948	—	—	1	1	
1949	—	—	—	—	
1950	—	—	1	1	
1951	—	1	2	3	
1952	—	—	5	5	
1953	—	2	—	2	
1954	—	—	—	—	
1955	1	1	—	2	
1956	—	2	7	10	One well under production test.
1957	—	—	10	12	Drilling under way at two wells.
1958	—	—	5	7	Drilling under way at two wells.

Source: Dept. of Petroleum and Minerals, Karachi, Pakistan. Yearly total indicates wells completed in that year.

NATIONAL FACTORS

The Pakistan oil industry continues to face a situation with little crude production and relatively high imports. The government participates actively in the search for new oil, although during 1959 it indicated it wishes to get out of the oil exploration business, at least during the early stages—proposing to buy back later up to 25%. This has been resisted by the oil companies.

In contrast to practice elsewhere in the world, where little government money is made available, Pakistan invested more than $7 million in several operations during 1958. Included among recipients of this risk capital were Petroleum Development Corp. of Pakistan, which received over $2 million. Pakistan Petroleum Ltd. and Standard Vacuum each received about $1.5 million; the Pak-Hunt Petroleum project, Tidewater Oil, and Caltex each received about $500,000; and Pakistan Oilfields Ltd. obtained $21,000.

No changes have occurred in the government's general attitude toward income-tax rates or exchange regulations as summarized in *World Petroleum Report 1958* and *1959*. Conventions with the USA for the avoidance of double taxation of income apply in Pakistan.

NEPAL

No exploration, production, or refining operations have been reported.

Nepal, isolated from the rest of the world for centuries, is in the midst of the first of a proposed series of five-year plans by which it intends to take advantage of its national capital assets with the aid of The International Cooperation Administration of the United States. There has been almost no prospecting, and the extent of Nepal's mineral resources is not fully known. However, geological surveys recently have been started and indicate surprisingly good mineral resources, including oil. Most of the country will have been surveyed by 1965, according to present plans.

OIL LAWS

Controlling Statute*: Nepal has recently enacted new mining legislation (which includes oil) and mineral concession rules in the Nepal Mines Act 2013 (1957). The Mineral Concession Rules 2013 (1957) govern mining in the country in great detail.

* Source: Summary prepared for the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) by Ely, McCarthy, and Duncan; Tower Building, Washington 5, D. C.

TIMOR

EXPLORATION: The eastern half of Timor is controlled by Portugal, the western half by Indonesia. An Australian company, Timor Oil Ltd., has had a concession over 7,000 square miles of Portuguese part since 1956, and has drilled a wildcat at Aliambata to 4,165 ft, with good oil shows obtained. There are a number of oil seeps nearby; and on the west end of the island there are two seeps which produce about 3 bbl of 33-gravity crude daily from the Miocene and Eocene Tertiary rocks.

An American independent company, Tradewinds Exploration, Inc., in March 1959, acquired 50% of the 7,000-square-mile concession by agreeing to drill 15,000 ft of hole. Sunset International Petroleum Corp. subsequently purchased a participation in Tradewinds' 50% interest. Tradewinds retains 45% of the entire play. The first joint test well was spudded in on the Ossulari structure on August 13, 1959. This is a 5½-mile by 3-mile anticline located on the eastern end of the island. Ossulari No. 1 was drilled to 6,755 ft where pipe twisted off at this depth, making it necessary to abandon the well.

Timor Oil Ltd. has chosen the site for its next well, Ossulari No. 1a, about three miles north of Ossulari No. 1 which recently was abandoned. Drilling reportedly began in November 1959.

YOUR MOVE...

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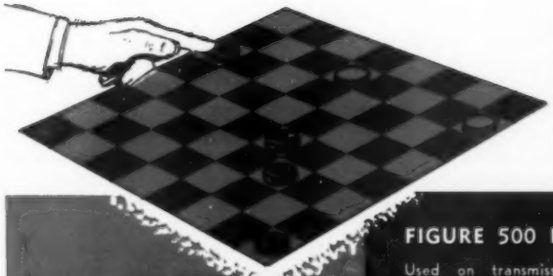

FIGURE 500

FIGURE 500 BLANK CAP

Used on transmission systems the world over for scraper traps, strainers, blowdowns and other installations requiring a "blanking" end. All sizes to 38", in ASA Series 150 through 1500, with or without hinges. Features O-Ring seal, 2-piece design.

FIGURE 505

FIGURE 303 MIS-ALIGNING UNION

Provides for 7½° mis-alignment in any direction without losing pressure seal. Mating parts move on arcs of a common circle to give smoothest mis-aligning movement. Ideal for use where temperature extremes cause expansion and contraction. Sizes to 8", for working pressures to 5000 psi.

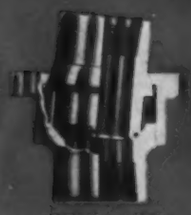

FIGURE 303

FIGURE 505 WELDING UNION

Fills all requirements of the transmission industry for a "quick" connection. O-Ring provides positive seal against gas, liquids or vapors, pressure or vacuum. Withstands temperatures to 400° F. All sizes to 24", in ASA Series 600.

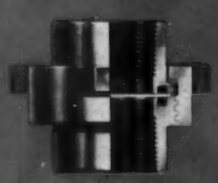

FIGURE 110

FIGURE 110 INSULATED UNION

Prevents electrolytic corrosion by breaking the flow of current. Non-conductor gasket has tremendous compressive strength — is resistant to all common acids, oil and gas. Double O-Rings assure positive seal. All sizes to 16", for working pressures to 10,000 psi.

FIGURE 400

REPRESENTATIVES

Slim LaGrone Co.—Odessa, Texas
Bob Hawk Eqpt. Co.—Hobbs, N. M.
Brailes & Cope—Wichita Falls, Texas
A. S. (Andy) Herran—Lake Charles, La.
C. B. Blair—Shreveport, La.
Louis Ray—Farmington, N. M.
Rocky Mtn. Spec. Co.—Casper, Wyo.

Howard Crider—Oklahoma City, Okla.
L. P. Kinnear—Great Bend, Kansas
Lee Snodgrass Co.—South Gate, Cal.
Neil Ginther—Wooster, Ohio
R. S. Stokvis & Sons, Inc.—New York
Thornton C. Hughes—Edmonton, Canada

FIGURE 400 CHOKE UNION

Regulates downstream pressure or volume through use of interchangeable orifice plates. Serves also as conventional union when full opening plate is used. All sizes to 4", for working pressures to 3000 psi.

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ALL UNIONS AVAILABLE WITH WELDING ENDS. BUY THEM THROUGH YOUR SUPPLY STORE.

PHILIPPINES

EXPLORATION: In September 1959, Republic Resources and Development Corp. (Redeco) made what may prove to be the first commercial oil discovery in the Archipelago. The wildcat, Reina Regente 1-A, was drilled to a total depth of 1,335 ft and casing set to the bottom. Sand zones at 1,214-28, 1,237-47 and 1,268-77 were perforated and acidized. The well was swabbed and the three zones flowed 41°-45° gravity oil intermittently through a ⅛" choke. The well was completed as a 72-barrel per day producer, presently shut-in.

Reina Regent 1-A-X, 35 ft east of the discovery well, was given a drill stem test between the interval of 1443-97 ft which is reportedly below the production zones in Reina Regente 1-A. The tool was open for 21 minutes. Gas rose to the surface immediately and oil flowed after 20 minutes. Approximately 15 ft of permeable oil sand was reported near the bottom of the tested interval. Drilling of Reina Regente 1-A-X was continuing below 5,200 ft as of December 2.

Philippine Oil Development Co. spudded Tigbauan 1 in Panay on September 16, 1959. Podco has a 70% and San Jose Oil Co. has a 30% net profits interest. Drilling of Tigbauan 1 was discontinued at 7,485 ft in late November. Tests of a number of possible gas-bearing zones will continue through December 1959.

During April 1959 Podco plugged and abandoned their wildcat well on the Calubian anticline in northern Leyte at a depth of 8,370 ft. A number of oil and gas shows were tested with negative results. Podco also conducted a shallow stratigraphic drilling program in the San Isidro area south of Calubian 1 during mid-1959.

Since mid-1956 San Jose Oil Co. (Pancoastal Petroleum Co. and Pantepec Oil Co.) has conducted extensive geological, magnetometer and gravity meter surveys of its concessions in the Luzon Central Valley, Panay and eastern and western Mindanao.

In August 1958 Standard Vacuum Oil Co. made the first important discovery of hydrocarbons in the Philippines when its Ipil 1 in the southern portion of the Cagayan basin, northeastern Luzon, encountered dry gas in a Miocene limestone section from 4350-70 ft. In 1959 Stanvac drilled three step-out wells from the gas discovery, i.e., Ipil 2 (T.D. 6294'). All three wells reported only minor gas shows and were plugged and abandoned. Prior to the three stepout wells the company drilled Abaca 1 in the northeastern portion of the basin. This well was plugged and abandoned at 7954 ft in January 1959.

In November 1959 Caltex spudded a test on the Illuru anticline in the northern portion of the basin. By December 5, 1959 the well was reportedly below 5,000 ft. however, it had not as yet encountered the principal objective horizon.

Acoje Oil Exploration and Drilling Co. is continuing with its shallow drilling in northern Cebu in an attempt to develop gas accumulations in the Barili limestone. In May 1958 a deep test was spudded on the Bogo anticline in northern Cebu. A number of oil shows were reported in a limestone section from 3,200 to 3,800 ft. The shows proved to be of no commercial significance and Bogo 1 was plugged and abandoned at 8,281 ft in September 1959. In October another test, La Paz 3, was spudded in northern Cebu. This well was also plugged and abandoned at 4,284 ft after showing only traces of oil and gas in several cores.

Maremco Mineral Corp. began a 3,000-ft test in Negros using a local Sullivan slim hole rig. By the end of November Pila 1 was at 1,750 ft with no reported shows.

Prospects in the Philippines are considered good; thick marine sediments correlate definitely with similar deposits in Java, Borneo, and Sumatra, and only three wells have gone to basement—which indicates only about 5% of the potential areas has been tested.

PRODUCTION AND TRANSPORTATION: There is no production in the Philippines, and no pipelines of importance.

REFINING: There is presently only one refinery, an 18,000 b/d plant at Batangas. It is owned by Caltex (Philippines) Inc., and has 7,500 b/d catalytic cracking capacity, with 9,000 vis-breaking and 950 b/d polymerization. However, several refineries are to be built. A new refinery of 25,000 b/d capacity is under construction by Standard Vacuum at Bataan, for completion in 1961. The government approved a proposal by Shell Co. of the Philippines Ltd. for a refinery of 20,000 b/d in Luzon. Local participation is 25%. Apparently, Shell has qualified under the Corporations Act, rather than the Petroleum Act which requires that 60% of the capital investment be Filipino. The refinery will be located at Cabcaban, Bataan peninsula. Gulf Oil Corp. formed a refining and marketing company in 1958 in which majority ownership will be Filipino interests. Government approval was received for a 10,000 to 17,000 b/d refinery to be built on the island of Luzon. Gulf will furnish the crude oil.

When the NEC approved Gulf's application, it suggested a financing plan which would limit Caltex and Stanvac to their 1957 marketing level. Royal Dutch/Shell would be permitted to refine and market a maximum of 20,000 b/d.

MARKETING: Consumption at present is around 47,000 b/d, but is rising rapidly. The population of the country is below what present resources could sustain, but is rising rapidly and demand is already only one-third less than that of Japan on a per-capita basis.

OIL LAWS

Recently there appeared a new type of publication which contains the original texts (translated, where needed, into English) of all oil laws and concession contracts of Asia and Australasia. It consists of a series of volumes entitled *"Asia and Australasia—Basic Oil Laws and Concession Contracts (Original Texts)."* It may be obtained by writing to the publisher, *Petroleum Legislation, P.O. Box 1591, Grand Central Station, New York 17, N. Y.* Supplements to the original volumes keep the laws contained up to date, and a number of other series (one for each major geographical area) cover the rest of the world. It is a highly recommended and unique series.

During 1959 no major changes occurred in the oil laws of the Philippines.

NATIONAL FACTORS

On a net basis, investment favorability is good. The government attitude is favorable; income taxes are low (28% maximum); the peso, valued at US 50 cents, is convertible; and considerable tax incentives are given.

A major drawback, however, is the Petroleum Act provision that exploring or exploiting companies must be at least 50% Filipino capital. For United States citizens or companies, this requirement does not take effect until July 3, 1974, but it applies now to all other companies —and, in any case, 1974 is not far away. In addition, the Laurel-Langley Agreement of December 31, 1958, took away all exploration rights from American companies unless they come from a state of the United States extending similar rights to citizens of the Philippines, in which case they may organize themselves into a corporation under Filipino laws, However, if companies do this, they lose their tax benefits in the USA, since only if they are a United States company can they take the depletion allowance, consolidate balance sheets with the parent concern, etc. It is probable that companies from now on will have to be formed with Filipino participation, as was San José Petroleum.

PHILIPPINES—Estimated Consumption of Oil Products
(Thousands of Metric Tons)

	1958	1959
Motor gasoline	720	740
Kerosine	200	200
Gas-diesel oil	590	620
Fuel oil	610	660
Other products	130	140
Total	2.250	2.360
% increase over previous year	8	5

SOUTH KOREA

There has been no exploration for oil in Korea, and oil possibilities are almost nil, geologically speaking.

Korea has no oil refinery, but is interested in rebuilding one at Ulsan, destroyed during World War II. Several international companies have since shown interest in building a new refinery, but lack of an attractive investment law and an insufficient demand for refinery byproducts have inhibited investment in ths field.

Procurement and import of all oil supplies are handled by the USA armed forces, which are also responsible for storage and distribution for the UN and ROK* military. Storage and distribution for internal (civilian) use are handled by the Korea Oil Storage Co. (KOSCO), a joint venture of Shell-Standard Vacuum-Caltex, operating under a management contract. These arrangements were formalized in the Petroleum Operating Agreement, signed May 31, 1955, by the Republic of Korea, the United States, and KOSCO.

OIL LAWS

Oil exploration and development are subject to Mining Law No. 234, promulgated December 23, 1951.

*Republic of Korea

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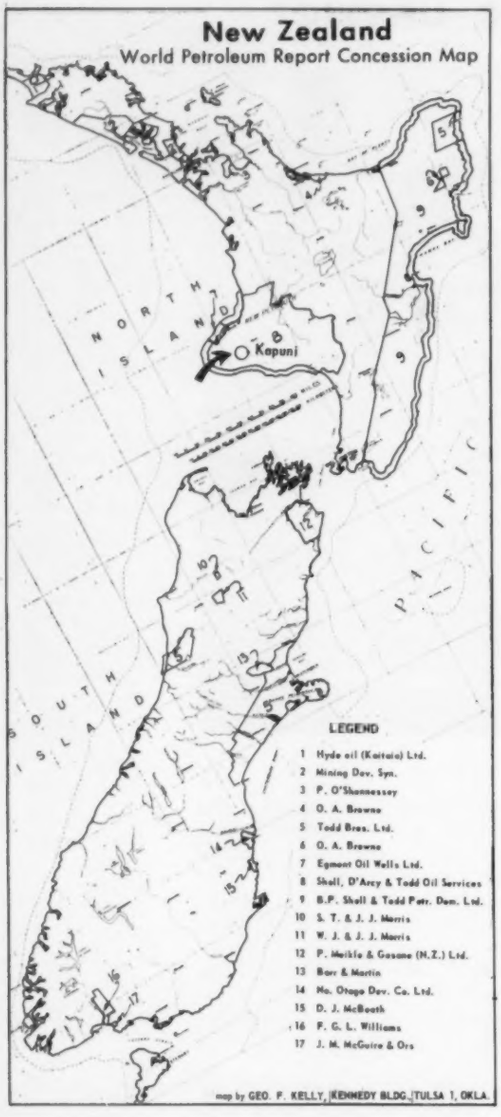
NEW ZEALAND

EXPLORATION: During 1959 a discovery was made at Kapuni No. 1 exploratory well, near Hawera, by the Shell/BP-Todd exploration group. According to the government, several thousand gallons of oil were obtained, with wet gas. Shell, the operator, announced that results have been sufficiently encouraging for exploration drilling to be continued in the Taranaki area and drilling is also to be extended to the east coast between Napier and Gisborne.

Initial arrangements are being made for the drilling of the first deep well of more than 10,000 ft in the Mangaone district near Nuhaka in Hawkes Bay Province.


New Zealand
World Petroleum Report Concession Map
NORTH ISLAND
SOUTH ISLAND
PACIFIC
Kapuni
LEGEND
1 Hyde oil (Kaitaia) Ltd.
2 Mining Dev. Syn.
3 P. O'Shannessey
4 O. A. Browne
5 Todd Bros. Ltd.
6 O. A. Browne
7 Egmont Oil Wells Ltd.
8 Shell, D'Arcy & Todd Oil Services
9 B.P. Shell & Todd Petr. Dev. Ltd.
10 S. T. & J. J. Morris
11 W. J. & J. J. Morris
12 P. Meikle & Gosame (N.Z.) Ltd.
13 Barr & Martin
14 No. Otago Dev. Co. Ltd.
15 D. J. McBeath
16 F. G. L. Williams
17 J. M. McGuire & Ors
map by GEO. F. KELLY, KENNEDY BLDG., TULSA 1, OKLA.

The potential petroleum fields of New Zealand lie chiefly in the areas of post-Jurassic sedimentation, and the sediments particularly concerned are parts of the Cretaceous sequence and parts of the lower Tertiary. These areas lie in Northland, the east coast of North Island from East Cape to Cook Strait, and the west coast of North Island in the Taranaki-Wanganui area. On South Island, similar areas occur in Westland, in the vicinity of Greymouth, and North Canterbury, extending under the Canterbury gravels; to a lesser extent they are also found in western Southland. In addition to the foregoing, the upper Jurassic sediments in North Canterbury and Marlborough contain oil and carry oil seepages, but so far these have not been thoroughly investigated and are little undertsood. As yet, no definite source beds have been described, although there are varying opinions as to the source of the potential of certain beds of the Cretaceous and lower Tertiary. There are, however, a number of formations which might well be suitable reservoir beds.

PRODUCTION: There is only one small oil field. Egmont Oil well produces the area from four wells in an area where 50 have been drilled in 93 years (production began about 1865). The company produces annually about 7,150 bbl of crude and 8 to 10 million cubic feet of natural gas.

Oil shale has been sent for bulk testing in Union Oil Co's retorting plant. Union, which tested some oil shale from New Zealand, has indicated a commercial retorting plant could be designed to handle this shale. If bulk tests bear this out, Union Oil has indicated an interest in considering financial participation in a New Zealand company to work the deposits. Deposits of oil shale, estimated at 2,000 million long tons (each ton estimated to contain about 13 Imperial gallons of oil), are located in the Nevis valley near Cromwell.

REFINING: There are no refineries in the country, but a 40,000 b/d plant is planned with Shell, BP, Caltex, Standard-Vacuum, Atlantic, Union, and Europa companies to take part.

OIL LAWS

The oil laws of New Zealand, along with all the laws of the remainder of Australasia and Asia, were published in *"Asia and Australasia—Basic Oil Laws and Concession Contracts (Original Texts)."* The entire text of the laws is contained, and provision made to add supplements to the original volumes, keeping them up to date with legislation passed subsequent to initial publication. Inquiries for further information should be addressed to the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

Oil regulation is contained in the following laws: The Petroleum Act, 1937, passed December 11, 1937, as amended by Sections 59 to 63 of the Statutes Amendment Act 1941, passed October 17, 1941; The Petroleum Amendment Act 1953, passed September 17, 1953; and the Petroleum Amendment Act 1955, passed October 20, 1955. [Regulations to the act are contained in the Petroleum Regulations 1939, passed March 15, 1939 (Serial No. 1939/30) as amended by the Petroleum Regulations 1939, Amendment No. 1, passed October 11, 1956 Serial No. 1955/183).]

OIL LAW SUMMARY

All petroleum is declared to be the property of the crown.
PROSPECTING LICENSE: Initial period is five years if conditions substantially complied with. **Area:** 200 square miles, but the same person may hold any number of licenses. **Annual Rental:** Five shillings per square mile. **Royalty:** Not less than 5% of value at well head. Royalty reduced by rental paid for same period. **Deposit:** $2,800 may be required as security for compliance.
MINING LICENSE: Holder of prospecting license who has substantially complied with the conditions is entitled to mining licenses over all or any part of prospecting license; terms and conditions to be stipulated by the Minister at the time the prospecting license is granted. **Initial Period:** 42 years; provision for renewal up to 63 years. **Area:** 10 square miles. **Annual Fee:** $28 per square mile. **Deposit:** $56 for each square mile. **Royalty:** Similar basis as for a prospecting license.

NATIONAL FACTORS

The governmental attitude is favorable, and the country is favorably situated in a crude-short marketing area. Income taxation is high, however, (60% maximum).

THAILAND (Siam)

EXPLORATION: There are no private companies exploring in Thailand. Two areas, shown on the accompanying map, are currently being explored by the Defense Energy Department and the Royal Department of Mines, respectively.

Except in a small tongue of land in the far south, the country is all reserved for government prospecting and mining under the Mining Act of 1918 as amended in 1950. Thailand's geological prospect in respect of petroleum do not appear very favorable, and much of the territory is remote.

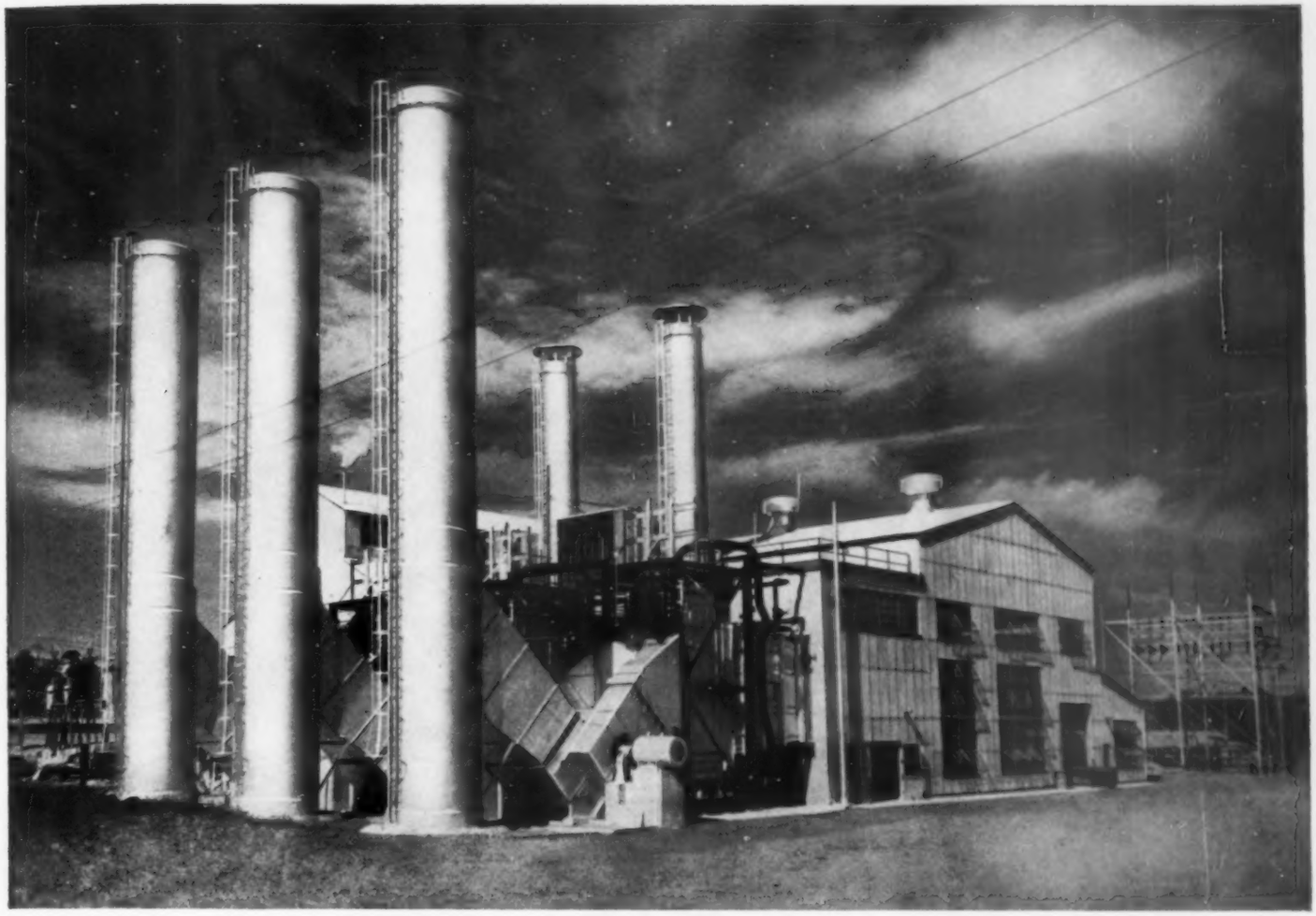
Crude-oil production in Thailand is about 200 b/d. To date 57 wells have been drilled near Fang, and oil was found in 23 of these. This is the only crude producing area in the country.

Crude-oil operations are under the Defense Energy Department of the Ministry of Defense. Drilling and refining operations were assisted by Refining Associates, of Long Beach, Calif., until the contract ran out in August 1959. A refinery near Fang (a topping and cracking operation) has been operated since late 1958 on an experimental basis. It could operate efficiently at 1,000 to 1,400 b/d, but shortage of crude holds it to a stop-and-go basis.

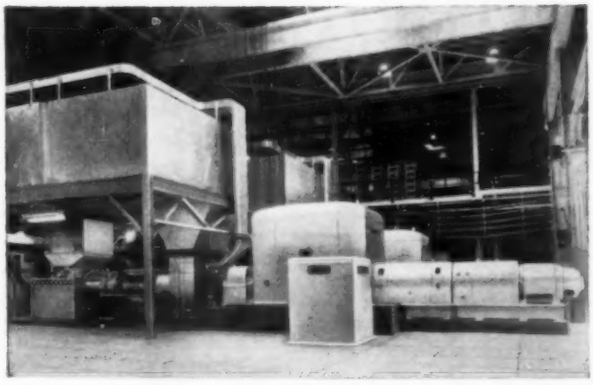
REFINING: During 1958 the government issued Revolutionary Proclamation No. 33, designed to attract investors, including the possibility of granting them monopolies. A number of companies have offered to construct refineries. Two local marketers, Shell and Stanvac, proposed a joint 35,000 b/d refinery with 25% participation by the government. Eastern Petroleum, associated with Standard of Indiana, made a more startling proposal which involved construction of a 25,000 b/d plant at the company's expense, to be expanded later to 35,000 b/d and to be turned over to the government after 10 years. The plan almost hit a snag when the government objected to Eastern's condition that, if the company expanded the plant, it should be given another 10-year period to operate it; however, it reportedly was accepted in December 1959.

The government plans to expand its 1,000 b/d plant to about 5,000 b/d, and reportedly

(Continued on page 62)



GENERAL ELECTRIC EQUIPMENT HELPS MODERNIZE COLOMBIA'S EL CENTRO POWER PLANT



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Included in the modernization equipment were two new General Electric 5-mw gas turbines, two supplementary-fired waste-heat boilers—all supplied by G.E. Still operating with this new equipment is a G.E. 5-mw steam turbine that was installed in 1930. These added facilities at El Centro will help increase Colombia's production of much needed petroleum, gasoline and liquified petroleum gas, and help increase the net dollar earnings for Colombia.

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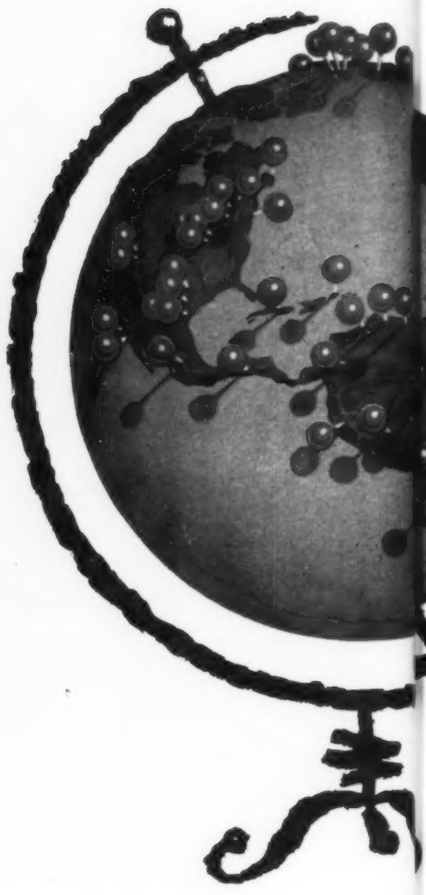

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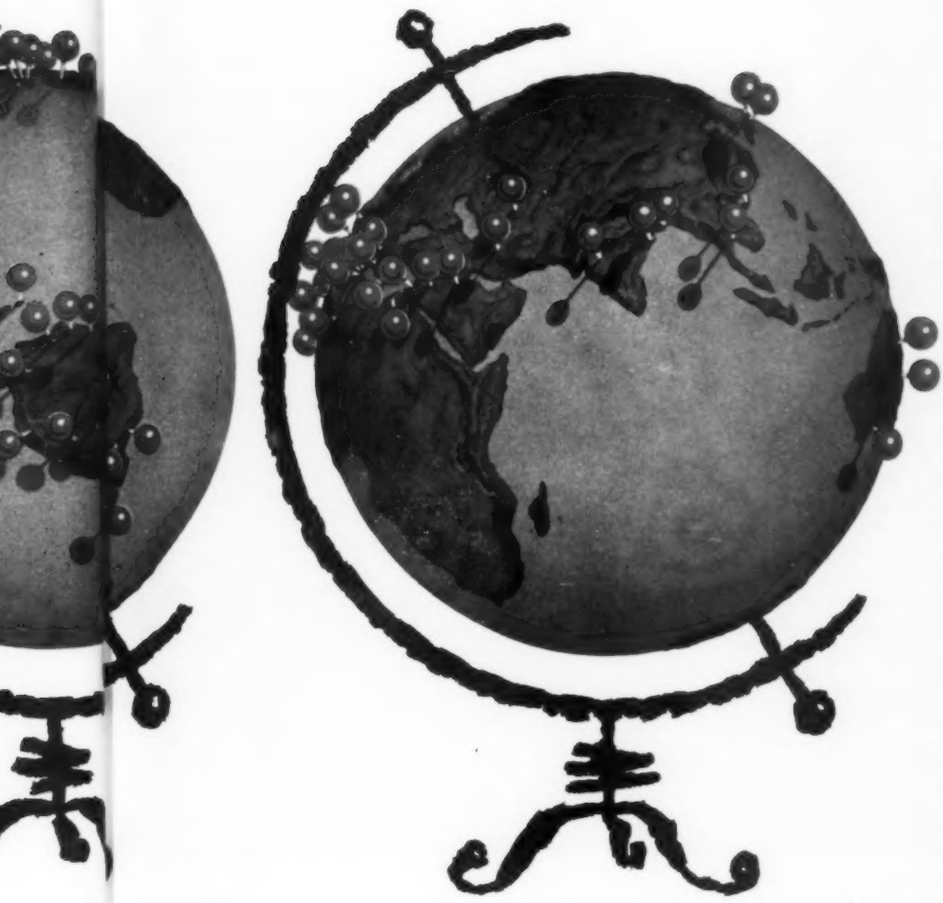
TOMORROW'S PROGRESS PLANNE



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has signed an agreement with the Fiji Car Co. of Japan for a 5,000 b/d refinery, expandable to 15,000 b/d. It will be operated by the Defense Ministry.

A shale deposit, estimated to contain two billion tons of shale with a 26% oil content, is located near Mae Sot, in extreme western Thailand. A Japanese firm plans to supply equipment for a 6,000 b/d shale-oil plant, with Thai interests supplying another $8 million from a United States loan. The plant would be built at Mae Sot, and would produce 3,100 b/d.

OIL LAWS

There is no oil law in Thailand at present. The government let it be known, however, on October 25, 1958, that it is "willing to let foreign agencies undertake oil business here on a fair basis."

PAPUA

EXPLORATION: Despite very large sums spent on exploration, no major discovery has been made. On November 4, 1958, a discovery was made by Australasian Petroleum Co. Pty. Ltd. at Puri No. 1 at 10,100 ft. The well produced at the rate of about 1,000 b/d, but the results of long flow tests indicated the well would produce comparatively small amounts of oil. Puri No. 1 is located at latitude 7° 06′ 24″ south; longitude 144° 59′ 56″ east.

A deviated hole, Puri 1A, was drilled to check on the formation. A small flow of gas, oil, and water occurred in this deviated hole on April 21, 1959, between 7,498 ft and 7,528 ft. This was accepted as indicating the producing formation does not extend on that side of the original hole. A second deviated hole, Puri 1B, was then drilled. Drilling was stopped at 8,520 ft in an unproductive formation. Another wildcat was being drilled at the year's end at the Bwata structure, 15 miles northwest of Puri.

PAPUA (AUSTRALIAN NEWGUINEA)—Record of Wells Drilled*

Year	Oil	Gas	Dry	Total
1958	—	—	4	4
1957	—	—	4	4
1956	—	2	—	2
1955	—	—	3	3
1954	—	—	—	—
1953	—	—	—	—
1952	—	—	—	—
1951	—	—	—	—
1950	—	—	1	1
1949	—	—	3	3
1948	—	—	2	2
Total	—	2	17	19

*All by Australasian Petroleum Co. Pty. and Island Exploration Co. Pty. Ltd.

The companies plan to invest $6.7 million during 1960 evaluating oil prospects for what may be the last evaluation. Expenditures through 1958 had totaled $65.25 million, and the companies had planned to withdraw, until the Puri find came along. Gas has been found in two very remote areas, Kuru No. 1 and Barikewa No. 1.

The two most active companies are Island Exploration Co., owned 45% each by British Petroleum (formerly Anglo-Iranian) and Vacuum Oil Co., and 10% by Oil Seach Ltd. It is under the same management as the second company, Australasian Petroleum Co. Pty. Ltd., which is held by the same companies in 40-40-20 ownership.

A third company, Papuan Apinaipi Petroleum Co., with exclusively Australian capital, has held an exploration right northwest of Port Moresby for some years, but has not made any discoveries. Following the Puri find, two independents, Camelot Nominees Pty. Ltd. and New Guinea Gold & Petroleum Development, applied for drilling rights in Papua. Camelot is owned 50% by Murphy Corp. New Guinea Gold has applied for 1,650 square miles near the Dutch New Guinea border, where it had held a license which was given up in 1958.

PRODUCTION, REFINING, CONSUMPTION: There is no production or refining. Oil use is very small, almost nil.

OIL LAWS

The oil laws of Papua, with the oil laws of all other countries of Asia and Australasia, have been published in *"Asia and Australasia—Basic Oil Laws and Concession Contracts (Original Texts),"* a series of reference volumes. The original volumes containing these laws are kept up to date by supplements containing later legislation. Requests for information concerning the publication should be sent directly to the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

There has been no change in the national factors listed in *World Petroleum Report 1957,* with the exception of the new governmental incentives to investment, which are listed under the Australia section of this report. These are of little help in Papua, however, because they only apply to the first well in a new basin. At present, exploration expenses cannot be charged against other income and, with dividend tax, the government take rises over 50%.

TAIWAN (Formosa)

EXPLORATION: When China recovered Taiwan in 1945 under the terms of the 1943 Cairo agreement, she expropriated the Japanese-owned oil properties, and the industry has remained under government control ever since. No large discoveries have been made to date, and during 1958 and 1959 the oil hunt shifted from the central foothills to the western plains where oil was discovered in 1817. Oil-potential areas cover almost all of Taiwan. There are many young well-developed Tertiary formations and great deposits of Eocene sediments, consisting mostly of thick mudstones, shales, siltstone, sandstones, and alternations of these. Sandstone is the most important reservoir rock.

In 1959 the six rigs working were engaged mostly in reconditioning wells, although the Chinese Petroleum Corp., the government's company, is using one heavy (15,000-ft) rig. A major discovery, according to the Chinese Petroleum Corp., was made in 1959 on November 11, at Chinsui well No. 38. Put on formation test for the deeper sands since November 11, 1959, the well flowed 3,500,000 cu ft of gas and 65 bbl of 44 API gravity oil a day average for the first three days. Well No. 38 was selected as a deep zone test well after 12 years of production from shallow zones. The hole was deepened from 11,753 ft to 13,327 ft in July 1959. This is the deepest well in Taiwan. The well drilled through five sandstone formations within the mentioned depths. Formation test has shown the bottom-hole pressure to be about 7,250 psi. A 5/32-in. bottom-hole choke and a 13/64-in. surface choke were used in testing. Wellhead flowing pressure was indicated as 1,500 psi.

PRODUCTION: About 300 wells have been drilled in Taiwan. They are shown in an accompanying table.

Crude-oil production has dropped to about 35 b/d, part of a general decline which gave an average of 48 b/d in 1957, compared with 67 b/d in 1956. Natural-gas production has increased slightly.

REFINING: There is one refinery in the country, a 28,000 b/d plant at Kaoshiung, owned by the Chinese Petroleum Corp. It has 10,000 b/d catalytic cracking capacity. During 1958, there was added 4,000 b/d vis-breaking, 3,000 b/d thermal reforming, a 900 b/d alkylation unit, and a 10-ton-per-day sulfur unit.

OIL LAWS

During 1959 the oil laws of Taiwan were published in English translation in a new publication entitled *"Asia and Australasia—Basic Oil Laws and Concession Contracts (Original Texts)."* The laws of other countries of the Far East are contained as well, and provision is made for supplements later to contain subsequent legislation. Requests for information regarding this highly recommended publication should be addressed to the publisher, *Petroleum Legislation, Ltd., P.O. Box 19591, Grand Central Station, New York 17, N. Y.*

TAIWAN (FORMOSA)—Historical Drilling Review

Year	Wells Flowing	Wells Pumping
1946	28	38
1953	32	32
1954	34	34
1955	33	32
1956	31	31
1957	32	30

Source: Chinese Petroleum Corp.

Petroleum is governed by special Petroleum Regulations (No. 7098) promulgated by the Executive Yuan in 1954.

Regulations provide for State operation of certain petroleum areas which may be designated, as well as for private operation. The Ministry of Economic Affairs may authorize either an exclusively State-run operation or one in which both government and private capital participate.

OIL LAW SUMMARY

Prospecting Rights: Prospecting rights are good for one year only, and will specify the area. **Exploration Rights:** May be had for 50% of the area held under the prospecting right. Valid for two years (with renewal privileges for another two years). **Exploitation Lease:** Holder of exclusive exploration right is entitled to an exploitation lease for not more than 50% of the exploration area (or, in the alternative, to either the north or south half of a petroleum producing area). **Duration:** 20 years, renewable for another 20 years. Without the special permission of the ministry, an exploitation lease gives the holder no right to carry on refining, manufacturing, transportation, or other forms of activity apart from actual exploration and petroleum production.

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IN DRILLING

DU PONT CMC provides good control of fluid loss and viscosity. Its action as a protective colloid guards muds against contaminating effects of salt, gyp and anhydrite formations. Because CMC has excellent resistance to chemical and bacterial degradation, it can be used in high-temperature wells.

HIGH VISCOSITY CMC—developed especially for low-solids drilling muds, builds viscosity . . . provides good fluid-loss control and keeps mud costs down because of the minimal amounts needed to do the job.

LOW VISCOSITY CMC—minimizes fluid loss in drilling muds without adding excessive viscosity. In some cases, notably sea-water muds, it is used as a thinner to reduce mud viscosities and gels. It is also used extensively in lime-treated muds to avoid high mud viscosities often caused by starch.

DU PONT PLASTICS—Because ZYTEL® nylon resins have excellent bearing properties and abrasion resistance, they are now being used, for example, to manufacture sucker rod guides. ZYTEL prevents wear between rods and tubing in lifting fluid from a pumping well. TEFLON®—TFE fluorocarbon resins have a natural slippery surface; less torque is needed to turn shafts or stems equipped with packings made of TEFLON, even under high gland pressures.

DU PONT NEOPRENE SYNTHETIC RUBBER is widely used for rubber parts on drilling tools. Drill stabilizer bushings of neoprene operated successfully at 40,000 lbs. pressure in a 13,000′ hole. Other examples of neoprene parts: drill pipe protectors, casing guards, packing rings, piston rubbers and pipe strippers. Du Pont neoprene resists deterioration from heat, drilling muds and abrasion and has served oil drillers for over 25 years.

IN REFINING

THE WORLD'S FIRST manufacturer of tetraethyl lead, Du Pont's Petroleum Chemicals Division has served the petroleum industry for 37 years; this division also offers highly effective antioxidants, dyes and additives for fuel and lube oils.

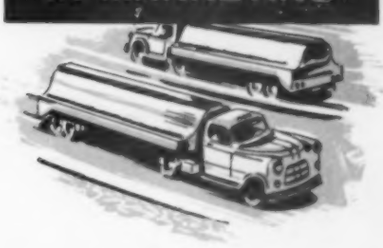
BOTH DU PONT NEOPRENE AND HYPALON* synthetic rubbers are used in various applications in the refining process. HYPALON hose has outstanding resistance to strong oxidizing chemicals. Neoprene gives remarkable service in transmission belting, as a protective jacket for wire and cable, for valve and pipe linings, tank linings and as a protective maintenance coating where corrosive atmospheres are encountered.

TEFLON RESINS have superior physical properties and withstand the most corrosive chemicals, even at elevated temperatures. For these reasons, it has gained widespread use in pipe linings, hose, gears, bearings, gaskets and packings.

WEED KILLERS—TELVAR monuron and KARMEX diuron kill unsightly weeds, reduce fire hazards and maintenance costs in refinery tank farm and pipeline properties. One application does the job for a season or longer.

DU PONT DULUX® TANK WHITE ENAMEL reduces evaporation losses of costly volatile liquids in atmospheric pressure storage. This evaporation, caused by heat, is minimized by the use of durable, high-reflective "Dulux" Tank White.

IN MARKETING



TIME HAS PROVED the exceptional durability of neoprene hose. Whether it's dock, curb pump, fuel oil or tank truck hose, performance records are convincing evidence of neoprene's extended service life. Neoprene tube resists deterioration from oil, gasoline or chemicals. Neoprene hose cover resists sunlight and weather, withstands rough handling that chips, cuts, abrades and causes flex cracking in ordinary hose.

DU PONT LUCITE® ACRYLIC RESINS are lightweight, durable, and have superior optical properties. These naturally lend themselves to the manufacture of signs, medallions and displays with eye-catching sales appeal for the retail outlet. *The corrosion resistance* and toughness of ZYTEL nylon resins make it ideal for bearing and valve parts in gasoline pumps. Moreover, its moldability often means fewer parts are required in an assembly, thereby improving operation and reducing costs.

ALATHON® POLYETHYLENE RESINS AND ZYTEL NYLON RESINS are used as insulating and jacketing materials for wire and cable because of their high dielectric strength and resistance to oils and chemicals.

**"Hypalon" is Du Pont's registered trademark for its synthetic rubber (Du Pont supplies only the neoprene and "Hypalon". It does not make the finished products described here. These are made by better rubber products manufacturers.)*

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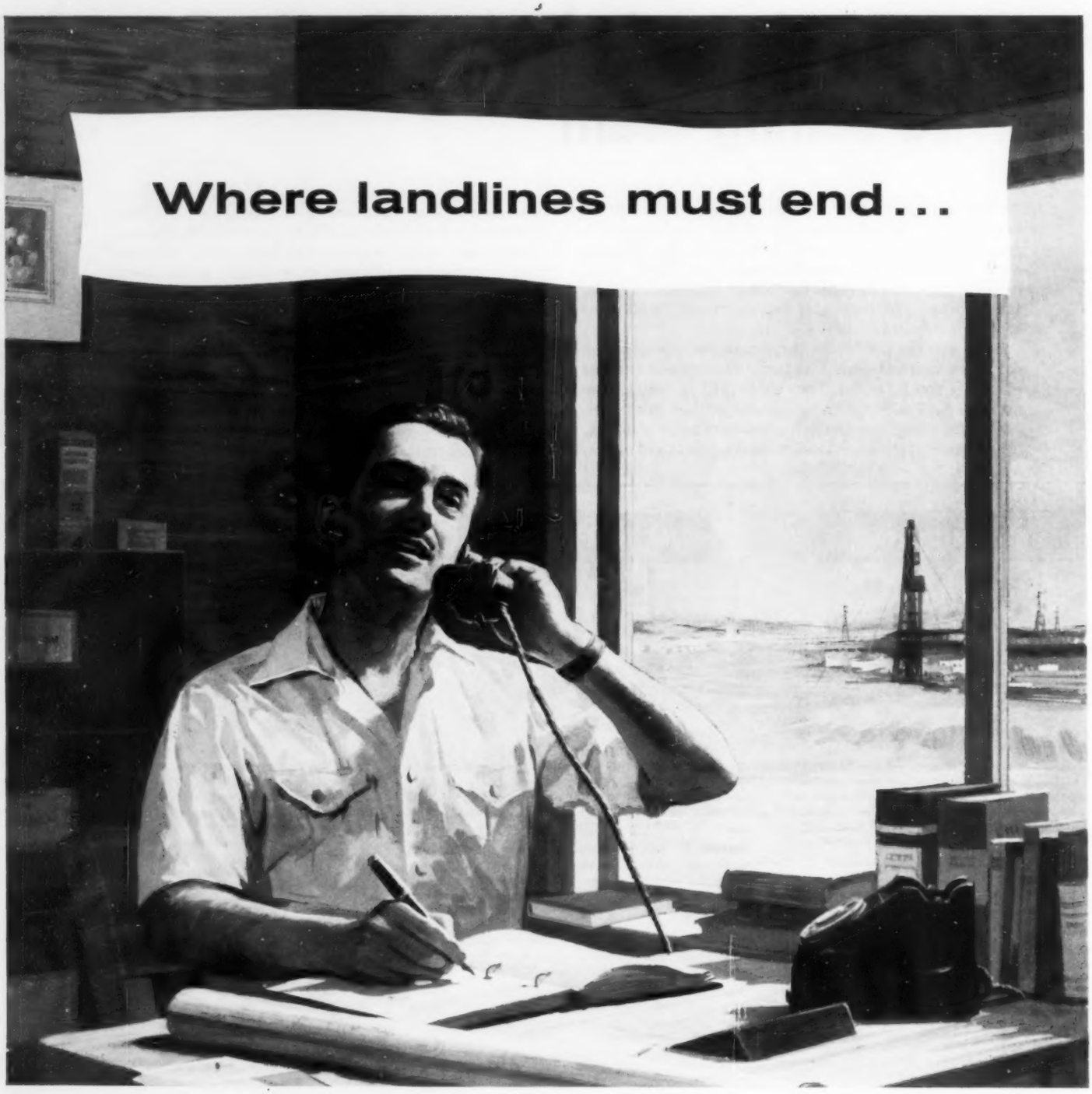

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When you're miles from civilisation with an important job to do, the telephone can play a vital part in solving problems. But perhaps physical conditions make the laying of cable or landlines difficult or uneconomic. What then? Why not let Rural Radio take over? This A.T.E. radio telephone is not limited to simple point to point service but can connect isolated subscribers into telephone exchanges of all types without introducing special operating procedures. A.T.E. Rural Radio equipment will also provide junctions between exchanges with all normal signalling facilities including dialling. Sets are available for operation from mains or from car batteries, so that in fact Rural Radio can be used anywhere in the world to provide full telephone service. Equipment of this type is functioning throughout the world.

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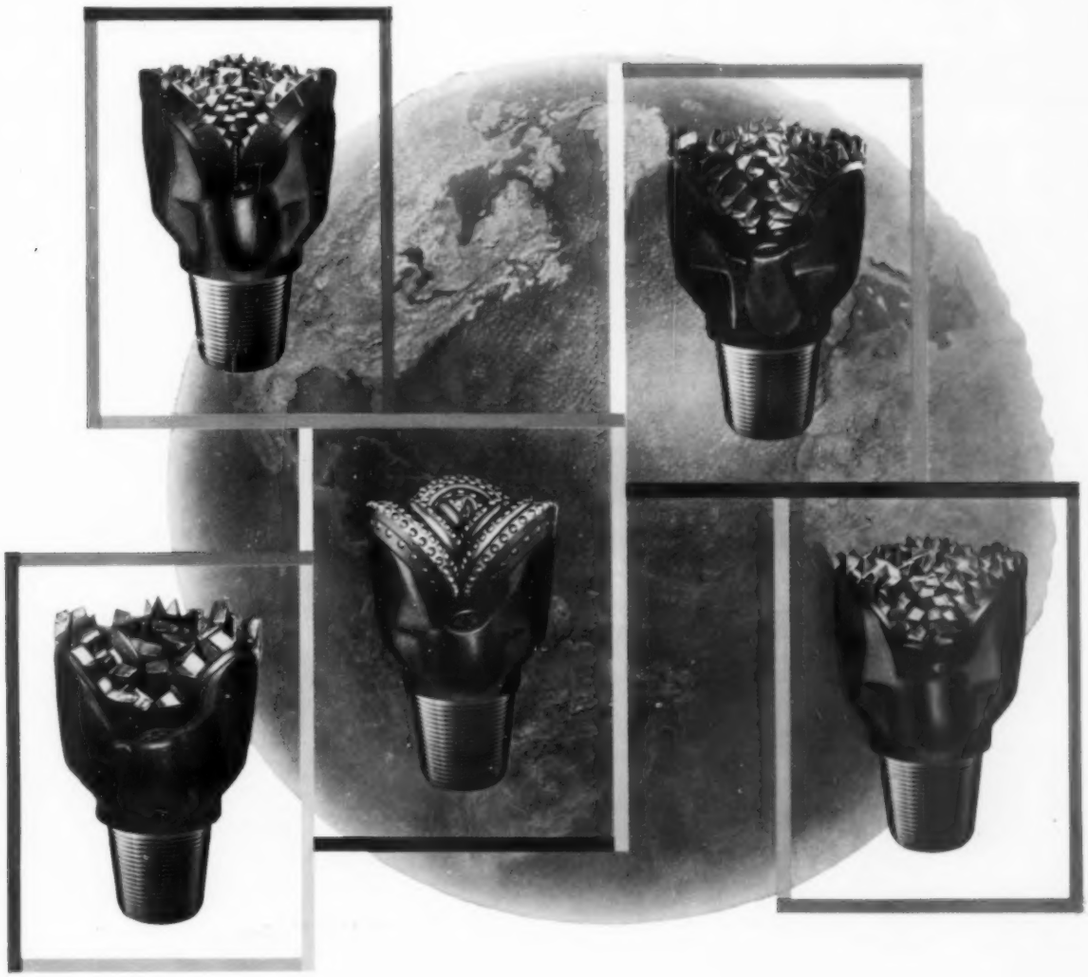


world's most widely used rock bits!

More Hughes rock bits are run in the oil and gas fields of the world than all other rock bits combined. Their performance is the yardstick by which the performance of all bits is measured.

Since 1909, Hughes bits have been used in drilling more than *two billion feet of hole*. This represents the industry's greatest accumulated rock bit experience. And it goes to work for you with every Hughes rock bit you run.

Along with that experience you get the benefit of Hughes' continuing research and engineering know-how that is responsible for *every major advance* made in cone-type rock bits. And with this you also get the benefit of Hughes' worldwide service.

HUGHES TOOL COMPANY

ORIGINATOR AND WORLD'S LEADER IN CONE-TYPE ROCK BIT DEVELOPMENT

Why "Seal·Grip" is your most dependable replaceable tool joint

DESIGN. All mating surfaces — outer seal, pipe threads and inner seal — are on the same taper, assuring uniformity of fit on initial and replacement installations. This feature permits make up to compensate for possible deformation when applying new joints on used pipe, or old joints on new pipe.

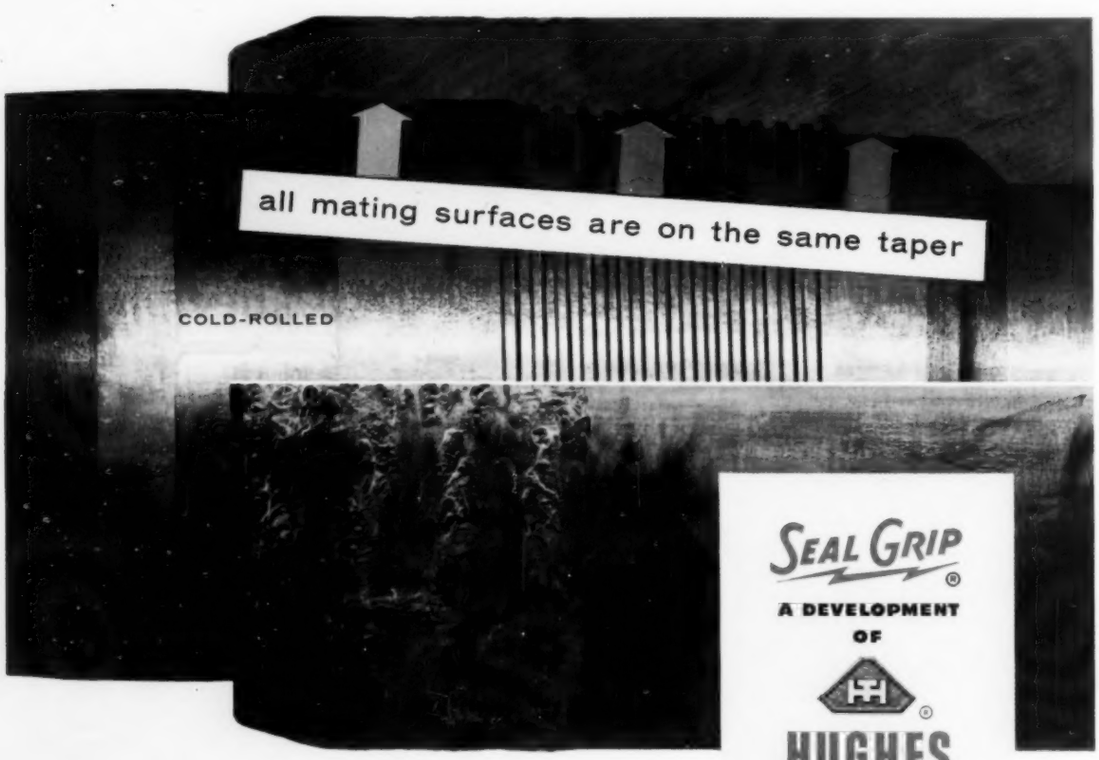
COLD-ROLLING. The large land of all "Seal-Grip" pipe is cold-rolled at the mills. This process so increases the fatigue resistance of the pipe that failures have been eliminated in this zone.

COPPER PLATING. To protect the threads and shoulders against galling during the critical break in period, all Hughes tool joints are copper plated. Years of service have proved copper plating to be the most effective anti-galling agent yet developed for tool joints.

HARDFACING. "Hughesite"—developed and manufactured by Hughes — assures long-lasting protection against tool joint wear. Interruption of the guide ribs with hardfacing provides a continuous wear-resistant surface that protects the guide ribs and adjoining tool joint metal against undercutting.

SNOW TESTING. In addition to processing controls to safeguard the quality of Hughes hardfacing, all Hughes hardfaced tool joints are "snow" tested — a new inspection method that is a positive check of the bonding of hardfacing to the parent metal of the tool joint.

40 YEARS EXPERIENCE. Starting with the first alloy heat treated tool joint, Hughes has put more joints on pipe than all other manufacturers combined.



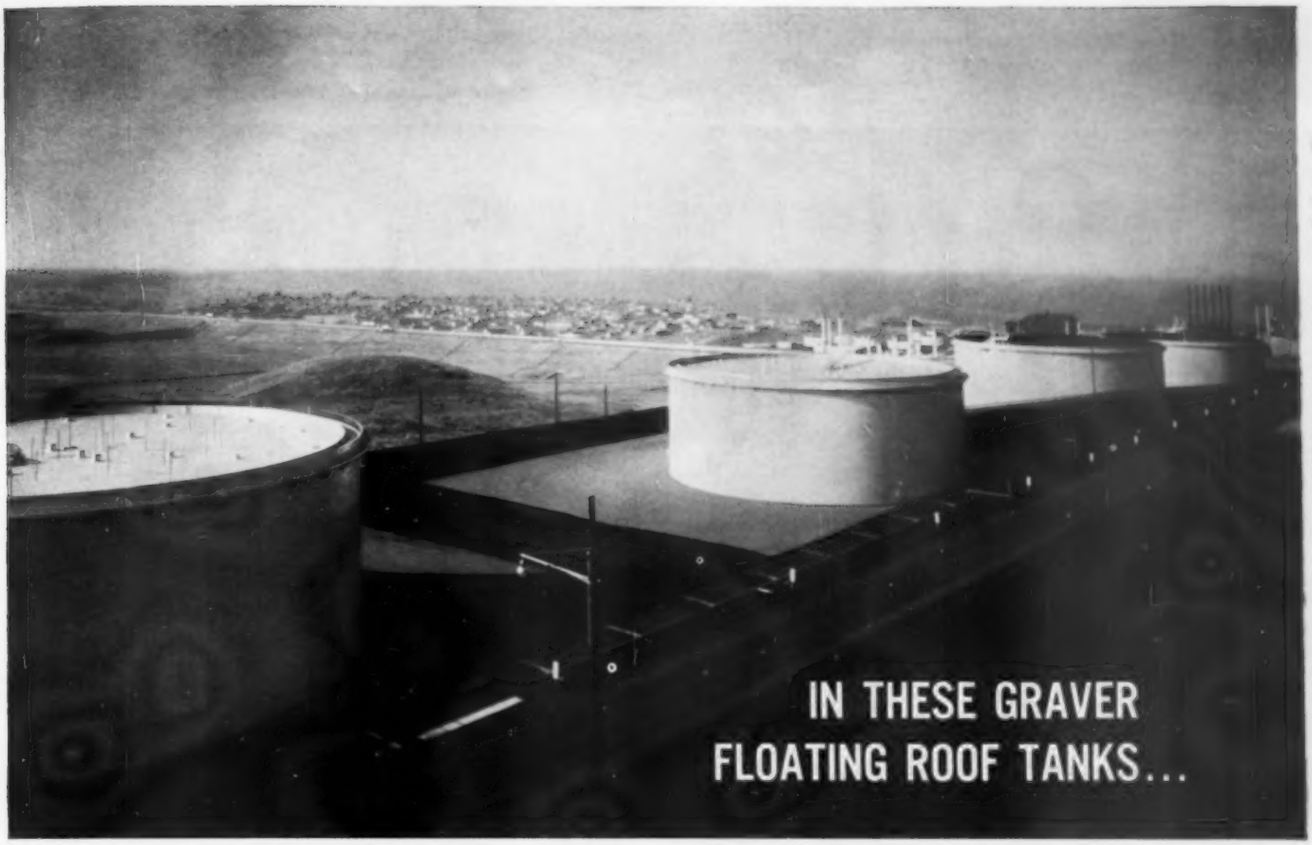
"Seal-Grip" tool joints are also available for attachment on new API LIGHTWEIGHT drill pipe.

SEAL GRIP®

A DEVELOPMENT OF

HUGHES TOOL COMPANY

HOUSTON, TEXAS



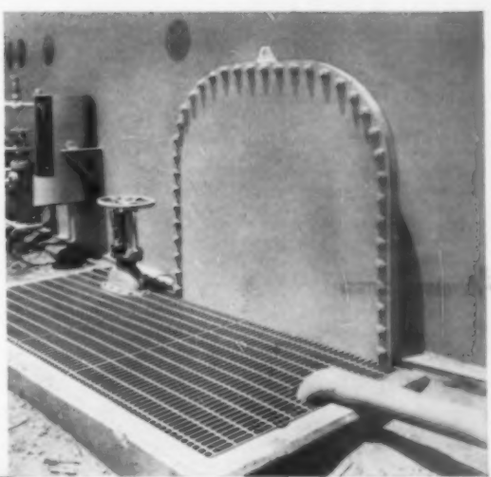
Unique Sloping Bottom Permits Fast Clean-Out, Rapid Seasonal Change-Overs

Who said that there is nothing new in tank design?

By sloping the bottom of the four Graver double-deck floating roof tanks shown above on a single plane, one inch each ten feet, to a 4′ x 4′ clean-out door at the low point, the tanks can be used for various seasonal products without costly clean-out procedures. The idea, conceived by a Union Oil Company project engineer, works so well that change-overs can often be made without internal cleaning.

Fabricated and erected by Graver, the tanks are 130′ dia. x 48′ high. They are located at Union Oil's Oleum Refinery at Rodeo, California. In keeping with Union Oil's belief in favorable public reaction, two tanks were painted pastel green and two pastel pink, attractive additions to the roadside scenery on the nearby U. S. Highway 40 Freeway.

Graver's century-experienced craftsmen are called upon regularly to fabricate and to develop ideas like this which improve operating efficiency and reduce costs. Graver engineers can help you secure more effective use of your storage facilities, too.



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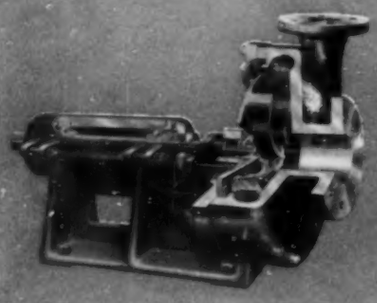
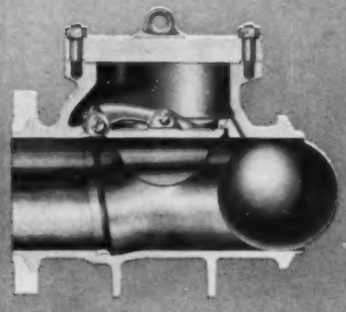


MISSION CENTRIFUGAL PUMPS are built to give long life, easy maintenance and trouble-free operation under all conditions. They feature a concentric casing that gives streamline flow at all flow rates and speeds. Mission Centrifugal Pumps are made in a variety of materials to resist abrasive or corrosive fluids.

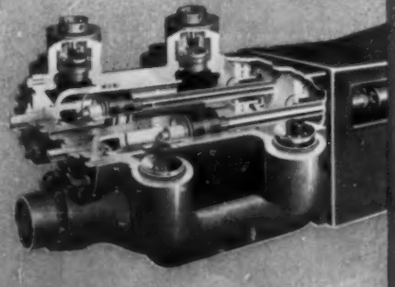
MISSION DUO-CHEK VALVES are about 90 per cent smaller than other check valves, making for easy installation, easy maintenance. The 12" size, for example, is only 4" long. These valves feature anti-slam spring closures which assure perfect seating in any position, yet they open easily with only ounces of pressure. A new type synthetic seal prevents seepage even at extremely low pressures.



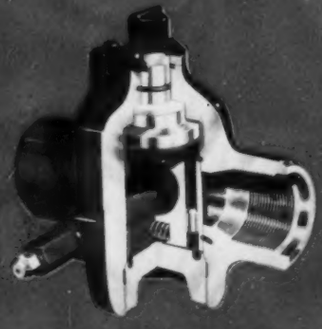
MISSION CONDUIT-CHEK VALVES are especially designed for product lines where spherical separators are used to prevent intermingling of different liquids. In its open position, the clapper is shaped to permit "conduit" flow. This design permits the easy passage of spherical separators, pigs, or scrapers.

YOU GET THE MOST FROM MISSION

MISSION RECIPROCATING PUMP PARTS. Mission makes a complete line of fluid end parts for double acting, piston-type reciprocating pumps. Three types of valves, three types of liners, two types of liner packing, two types of piston rods along with pistons and rod packing give a wide choice to satisfy most requirements. Parts made of special materials are also available on special order. Used in combination, Mission parts reduce pumping costs.



MISSION VALVES feature a split cylindrical rotating core that assures perfect sealing without wedging. Line pressure performs two functions. First, it holds the downstream core half against the body. Second, it provides power for an automatic sealant injection system that literally stops leaks before they start. The result is long life with exceptional freedom from trouble.



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MIDDLE EAST

EXPLORATION: Exploratory discoveries were made during 1959 in Iran, Abu Dhabi, Syria, and Israel. An offshore well by Japanese interests seemed well on its way to finding oil in the Neutral Zone, but struck high-pressure gas at shallow depth instead and caught fire, delaying operations by several months. For details concerning these operations, see the appropriate country sections.

PRODUCTION: During 1959 Middle East production continued to rise, but in most countries the rate of increase is slowing. Production has increased at the rate of 11.5% compounded since 1949. Less than half that rate of increase is indicated for coming years.

REFINING: Refining capacity in the Middle East totals 000,000 b/d. There are two new refineries under consrtuction, including the Homs refinery in Syria (being built by communist technicians) and the Jordan refinery near Amman, the capital.

TRANSPORTATION: Additions were made to pipeline transport facilities during 1959 in Saudi Arabia, Iran, Iraq, and in Israel. A large pipeline from the Persian Gulf to the Mediterranean was proposed by the Arab League Oil Committee during the Arab Oil Congress in Cairo during early 1959. The proposal received some oil-company support, since the economics are feasible. It replaces, in fact, a similar plan oil companies had but abandoned three years ago, partly because of the vulnerability of pipelines to political action, which was so clearly evident in the recent Iraq crisis, and partly because of lower tanker rates. The Arab League plans to build a large system with feeder lines from Saudi Arabia, Kuwait, and Iraq. The line would run to Tripoli, in Lebanon, or to Banias, in Syria. Because it would be Arab-owned, it would be less vulnerable to political conflict sabotage; and it might end the dispute among transit countries over right-of-way fees. However, the present tanker surplus makes the system less feasible now.

A 26-mile 30-in. concrete-coated pipeline has been begun from Ganaweh, in Iran, to Kharg Island, 25 miles out in the Persian Gulf, for Iranian Oil Exploration & Producing Co. Dual 32-in. submarine pipelines are to be constructed for Basrah Petroleum Co., linking a tank farm at Fao, in Iraq, to an artificial island 24.3 miles out in the Gulf.

MARKETING: The Middle East remains Western Europe's principal supplier, and the world's largest oil exporter, as shown by accompanying tables.

Prices: The decline in Middle Eastern crude prices which began on February 13, 1959, with a cut by British Petroleum, went across the board and was following by all the major producers in the area. The cut extended to product prices as well, and its impact on the Arab oil countries was felt immediately in national budgets.

OIL LAWS

During 1959 a most important publication appeared containing the original texts, most of them published for the first time, of the Middle East's concession contracts and oil laws. It includes all the new contracts signed recently, such as the Japanese agreements in the Neutral Zone, and the Iranian contracts with Pan American and SIRIP, as well as the older classic documents such as the ARAMCO concession, the Getty Oil concession, and others. The publication is entitled *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* It may be obtained by writing to *Petroleum Legislation, Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

No major changes occurred in oil laws or concession contracts during 1959. In Syria, the Menhall exploration rights were cancelled, and in Aden a new oil law was in the process of formulation. The Saudi Arabian oil evidently was dormant. Iran was contemplating new concession bids along the same lines as those previous let.

Iraq passed a law providing for a new governmental committee on oil affairs to supervise oil matters. Israel concluded an important pipeline concession agreement. IPC gave up its concession rights in one of the minor Trucial sheikhdoms.

NATIONAL FACTORS

During 1959 the prospects for increased understanding between the companies and their host governments, so badly needed if either and both sides are to prosper, seemed to have gained a little. Some maturity of viewpoint was visible at the Arab Oil Congress, which was notable for its restraint on the part of the Arab delegates. Only one incident, an address by Frank Hendryx, American lawyer for Saudi Arabia, threatened to disrupt the congress. Mr. Hendryx submitted a paper asserting the right of any sovereign government to alter existing contracts at any time for its own benefit—a supposition which, if adopted, would remove all the rules from the game and make orderly and foreseeable development of oil impossible. Government delegates attending seemed to recognize this.

Arab oil aspirations, as expressed at the congress, may be summed up as follows: An Arab League subgroup should be 49% partner in all future oil agreements in Arab nations. Future oil accords should give Arabs a share of profits from transportation, marketing, and refining. Oil companies should be required to build refineries in the Middle East to refine at least 30% of their crude. Arabs should build a pipeline network connecting Persian Gulf fields with the Mediterranean. A permanent oil council should be created to unify Arab oil policy, with decisions binding on all countries.

The decline in prices announced just before the Cairo oil conference cut posted prices about 18 cents a barrel across the board. It meant a loss to the producing countries of apparently 9 cents a barrel, or about $135 million total (on the basis of 1958 production in the Middle East). Specifically, Iraq found itself short $24 million of its anticipated revenue; Iran was short about $27 million, Kuwait $46 million, and Saudi Arabia $35 million. These adjustments were extremely hard for the countries to make, and it has been proposed that increased communication between the companies and the governments concerned should be instituted which would warn of such drastic changes. These would not involve any approval or veto by the governments, but the latter would be consulted as a matter of common interest.

MIDDLE EAST—Crude-Oil Production
(Thousands of Barrels Per Day)

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Bahrain	30	30	30	30	30	30	30	32	41	45
Iran (consortium)	665	342	30	57	62	328	536	718	821	851
Iraq*	128	167	374	565	615	691	634	442	724	823
Kuwait	344	561	747	862	952	1,092	1,093	1,140	1,396	1,394
Qatar	33	49	69	85	100	115	123	140	174	172
Saudi Arabia-Kuwait										
Saudi Arabia	547	762	825	845	953	965	986	992	1,015	1,095
Neutral Zone	—	—	—	—	16	24	32	64	81	115
Total Middle East	1,747	1,911	2,075	2,444	2,728	3,245	3,434	3,528	4,252	4,495

*Excludes production from Naft Khaneh.

MIDDLE EAST—Estimated Oil Revenue, by Country
(Millions of Dollars)

Year	Bahrain	Iran	Iraq	Kuwait	Qatar	Saudi Arabia	Total
1950	3	45	15	12	1	112	188
1951	3	23	38	30	4	155	253
1952	4	—	110	165	9	211	499
1953	5	—	144	192	18	215	574
1954	8	9	191	220	23	225	678
1955	9	90	206	305	35	274	918
1956	8	152	193	306	38	283	980
1957	6	214	137	365	44	291	1,057
1958	6	246	237	415	60	304	1,269

Source: Economic Developments in the Middle East, 1957-1958.

MIDDLE EAST—Revenue from Oil Transport
(Millions of Dollars)

Year	Syria	Egypt	Lebanon	Jordan	Total
1950	0.4	38.6	0.1	0.3	39.4
1951	0.6	34.0	0.3	0.6	35.6
1952	0.7	37.7	1.4	1.4	41.2
1953	3.6	40.6	0.7	1.0	45.9
1954	2.2	45.1	1.1	1.0	49.4
1955	2.9	50.0	2.4	1.0	57.1
1956	15.8	49.3	1.4	1.0	67.5
1957	9.1	41.0	1.4	1.0	52.5
1958	15.5	71.6	1.3	1.0	89.4

Source: Economic Developments in the Middle East, 1957-1958.

These estimates of the UN Bureau of Economic Affairs are converted to dollars as follows: Syrian pounds—3.8 for 1950-52, 3.6 thereafter; Lebanese pounds—3.7 to the dollar for 1950-52, 3.2 thereafter.

ADEN

EXPLORATION: During 1959 and early 1960 no oil drilling was done, and little surface exploration was conducted. British Petroleum Co. Ltd. has ceased exploration in the Kamaran Islands, although it retains its licenses there.

PRODUCTION, REFINING, MARKETING: There is no production of crude. Refining is entirely by the Aden refinery, owned by British Petroleum Co. For a description of its facilities, see *WPR 1957*. Capacity of the refinery is 100,000 b/d (not 120,000 b/d, as reported in *WPR 1959*).

Marketing needs are principally for the Aden colony, with some going to the protectorate.

OIL LAWS

The oil regulations for Aden have been published in *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* This is a word-for-word compilation of the major concession contracts and oil laws in the Middle East, most of them never before published. It is highly recommended as the only publication of its kind. It is available from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be sent directly to that address.

No changes occurred in the colony's oil laws; for a summary of same, see *WPR 1957*.

Entirely different legal regulation is provided for the protectorate, where IPC has been operating through subsidiaries for a number of years. During 1959 the sultanates of Kathiri and Qu'ait reached agreement to share oil revenue one-third and two-thirds, respectively. These sultanates are under British suzerainty, and the British have been working out an entirely new oil law for all five sultanates of the Hadramaut to place them on the usual Middle East 50-50 basis. A draft of the new law is being circulated to interested parties.

ABU DHABI

EXPLORATION: Abu Dhabi Marine Areas Ltd., owned two-thirds by British Petroleum Co. Ltd. and one-third by Cie. Française des Pétroles, made a discovery in 1958 at No. 1 Adma, now No. 1 Umm Shaif. It was drilled from an offshore platform to a total depth of 8,775 ft. Tests completed of the Jurassic Arab Zone limestones produced only gas, but the Lower Cretaceous Shuaiba limestone flowed oil for a limited period at about 2,400 b/d. Oil is of 40 deg API gravity, with a sulfur content of about 1.4%. An appraisal well, No. 2 Umm Shaif, was spudded about December 15, 1958; it was drilled about two miles west of No. 1 Umm Shaif to 7,724 ft. It, too, found oil. No. 3 was drilled; it was a producer at 7,908 ft. Exact locations are:

No. 1—25° 12′ 3″ north, 53° 13′ 10″ east
No. 2—25° 11′ 58″ north, 53° 11′ 22″ east
No. 3—25° 12′ 0″ north, 53° 15′ 0″ east

Das Island is 250° 00′ north, and 52° 55′ east.

Onshore, Iraq Petroleum Co. is the sole operator. Seven wildcat wells have been drilled in the Trucial Coast, all of them very expensive and all dry with the exception of Murban No. 1. The Trucial Coast's first commercial oil discovery may have been established in 1959 by No. 2 Murban which produced 2,000 b/d in a brief test of two separate zones, apparently within 50-ft intervals. The test is at Tarif, 5 miles south of No. 1 Murban, which was drilled in 1953. It produced at the rate of 1,500 b/d, but ran into mechanical difficulties, and failed to test any oil when reopened.

AFGHANISTAN

EXPLORATION: The drilling reported in *WPR 1959*, p. 30, reportedly was suspended by the Russians, who are now participating in the country's exploration program. Little is known of the country's oil potential, but the best source is believed to lie near the Russian border. Seaboard Oil Co., now merged with Texaco, has considerable information on geology; but no company has yet devised a way to get oil out of the country if it ever should be found.

PRODUCTION, MARKETING: There is no production (nor refining). Marketing needs are very small, about 1,300 b/d, supplied mostly by the Soviet Union.

OIL LAWS

A new oil law has been completed, but not yet passed, so far as is known. USA advisors participated in its formulation (see *WPR 1959*).

NATIONAL FACTORS

A basic distrust of foreigners has not been alleviated by extensive aid from the USA and Russia. For a brief discussion of this factor, see *WPR 1959*.

BAHRAIN

EXPLORATION: The only exploratory well in 1959 was on the Buri structure northwest of Dukhan, the only producing field. It was bottomed dry in February, 1959. Exploratory efforts, which have been curtailed, now are directed to improved producing techniques. Bahrain Petroleum Co. (BAPCO), the only operating company, conducted marine surveys in the Jazayir and Fasht Jarim areas, and these surveys are being interpreted.

PRODUCTION: During 1959 production averaged about 45,000 b/d, and stayed very near that level every month during the year. No increase is foreseen in the future, since only one field has been found. Three tests drilled since 1937 to deeper horizons have found only gas. Unless oil is found offshore, exploration is finished. (For wells drilled since 1932, see *WPR 1959.*)

The Dukhan producing structure is a simple fold, with the major axis north-south in the center of the island. 147 wells produce from two Cretaceous limestone pays between 1,800 ft. and 2,300 ft. and a third Jurassic limestone, which also produces high-pressure gas for repressuring the field from about 4,300 ft. Gas injection has been under way since 1938, and is now carried on at about 32 million cubic feet daily to balance oil production and keep reservoir pressure at the original 1,200 psi.

MARKETING, REFINING: A total of 70,415,036 bbl of crude oil was processed at the Bahrain refinery in 1958, an average of some 192,918 b/d. This was 4.64% more than in 1957. The year's increase was due to marketing requirements.

TRANSPORTATION: The majority of refinery stock is imported via submarine pipeline from Saudi Arabia. There are two 12-in. pipelines from Saudi Arabia. They are 34 miles long, of which about 14 miles is under water.

BAHRAIN—Crude Source for Refinery Processing, 1958
(Barrels)

Bahrain	14,828,176
Arabian	48,668,088
Other	6,732,773
TOTAL:	70,229,037
Other stocks processed	185,999
TOTAL:	70,415,036
Daily average	192,918
Increase over 1957	3,124,101
% Increase over 1957	4.64

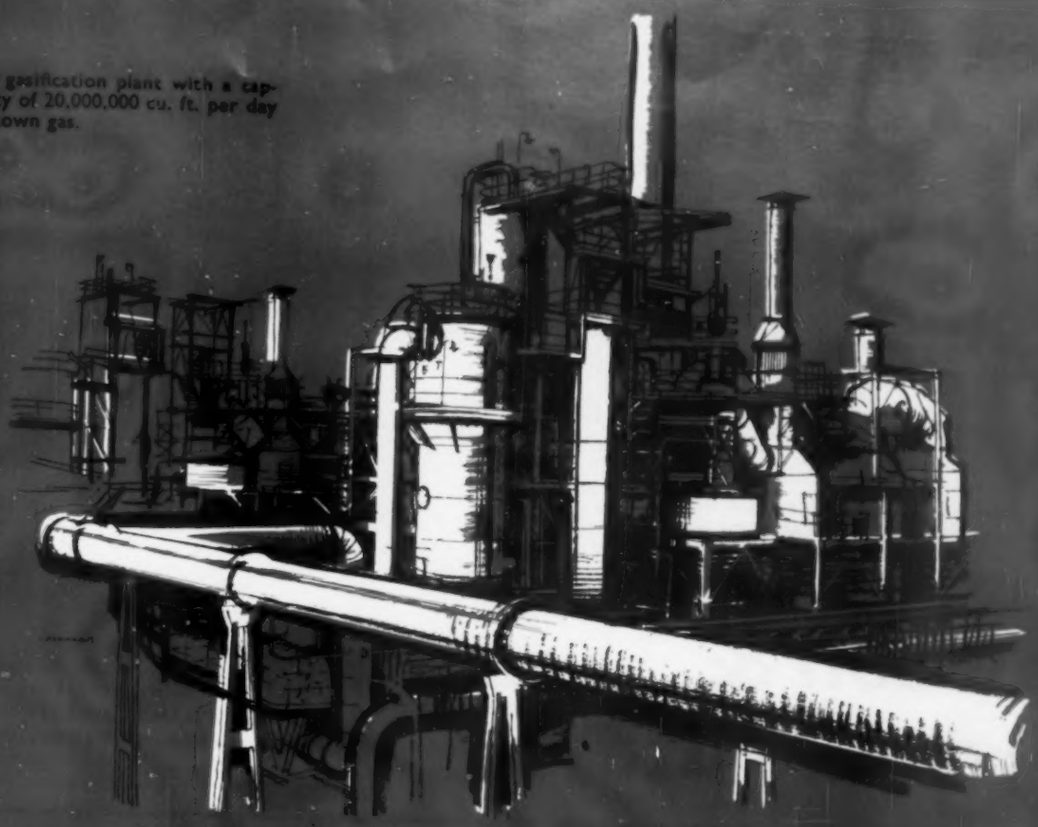
OIL LAWS

During 1959 an unusual compilation of Middle Eastern concession contracts and oil laws was published. It contains, with other materials, the recent agreement governing Bahrain's offshore area between Saudi Arabia and Bahrain. The study is entitled *"Middle East—Basic Oil Laws and Concession Contracts."* It contains such other documents as the concession contract of Aramco, Neutral Zone concessions, and other previously unpublished material. It is available from *Petroleum Legislation Ltd., P. O. Box 1491, Grand Central Station, New York 17, N. Y.* All orders for it should be sent to that address.

No change occurred in the basic concession agreement for Bahrain during 1959.

NATIONAL FACTORS

Company-government relations continued on an even keel during 1959. The company has made a strenuous effort to maximize use of national employees and to increase local purchases. BAPCO's direct contribution to the economy of Bahrain in 1958 amounted to 111 million rupees.



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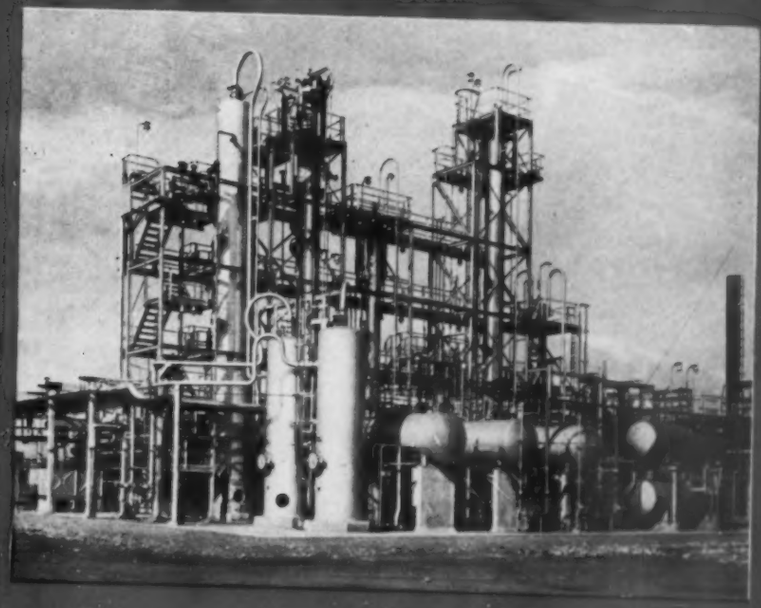

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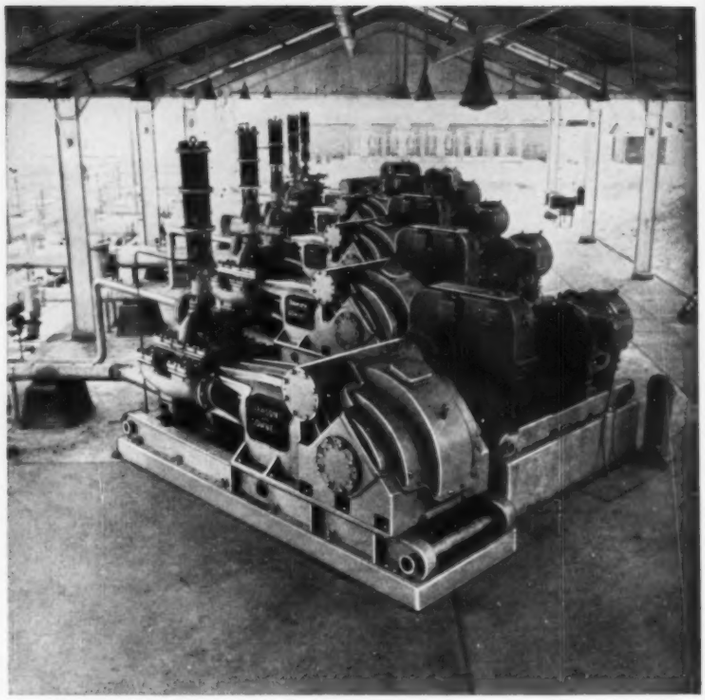

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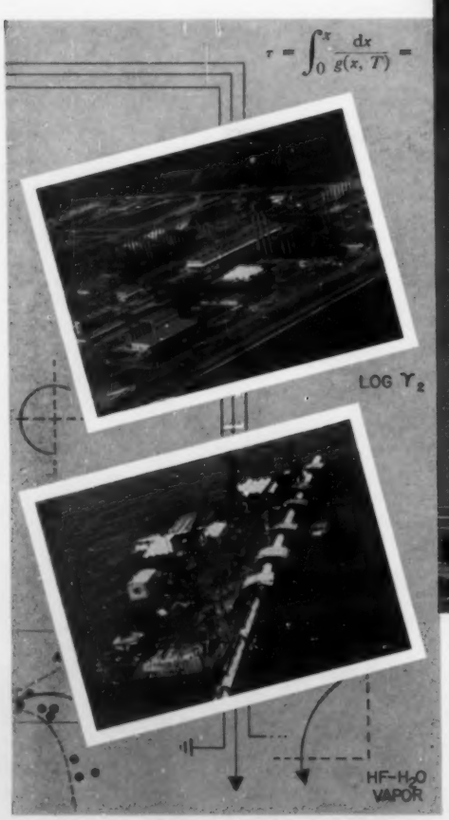

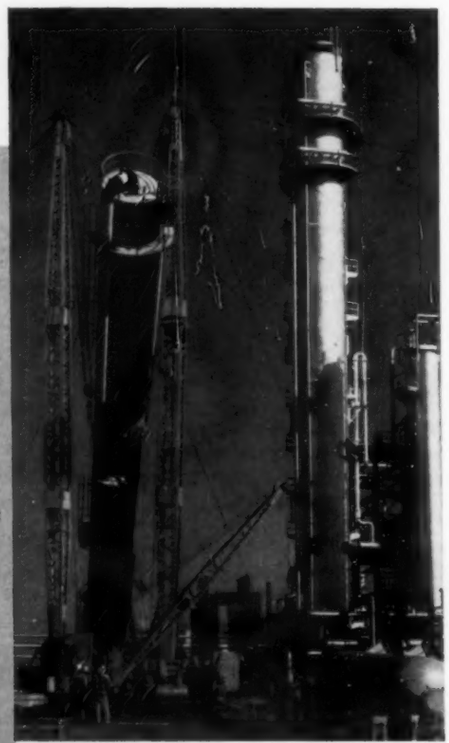

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IRAN

EXPLORATION: Drilling of major exploratory significance is underway, but as of the end of 1959 no discoveries had been reported. Pan American International, subsidiary of Standard Oil (Indiana), was drilling offshore (see map) from a fixed platform. Its first test, IPAC A1, was drilling without shows considerably below 7,000 ft in mid-December. SIRIP, owned by Agip Mineraria (subsidiary of the Italian government's ENI), is drilling two wildcats, one on top of Mount Sequta at 8,200 ft elevation. Operations were held up by heavy snowfall, and at December 7 the well had reached only 613 ft. An offshore well is being drilled by SIRIP (see map) and on December 7 was at 6,260 ft in shale and marls with no shows reported.

The Iranian embassy at The Hague denied during December 1959 that the Soviet Union had offered Iran 85% of the profits from oil exploration rights in northern Iran.

Iran has opened to competitive bidding Districts 18, 14, and 8 in remote northeastern Iran (see map). At last report, some companies had investigated the areas opened, but none had bid. The districts are rated considerably lower than either District 1 or the consortium area, and the problems of logistics involved are great.

A deposit of 130,000 pounds in an Iranian bank by the Canadian company, Sapphire Petroleum, was almost forfeited to NIOC for nonperformance on the concession areas Sapphire acquired in 1958. The company reportedly received a two-months extension in January 1960 to begin exploration without forfeiture of its deposit.

Consortium Exploration: The international consortium of companies was very active throughout 1959. A résumé of activities follows.

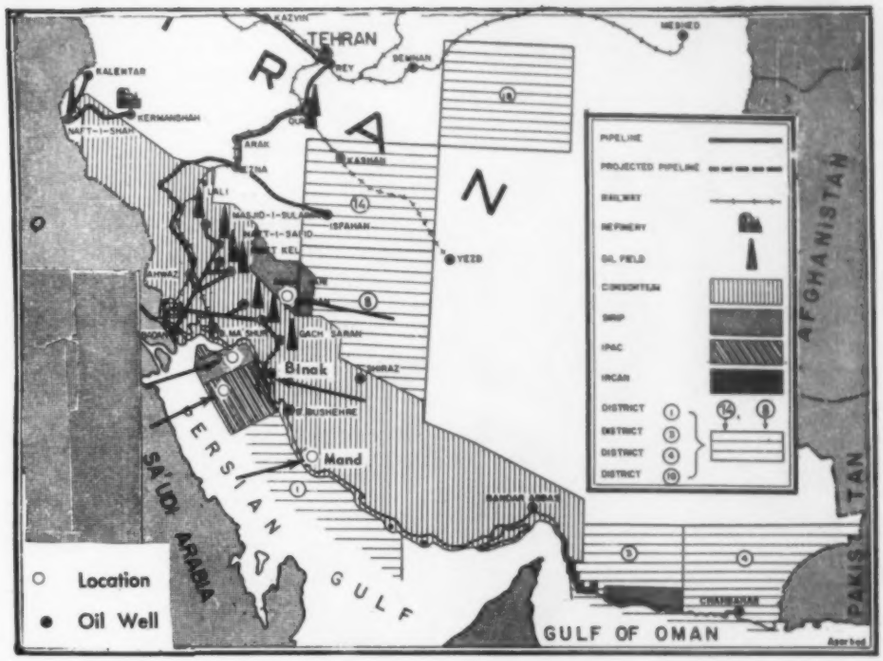
Exploration: Geological survey work in the Iraq border area, which had begun in 1958, was completed in March 1959. A gravity party completed the plains area survey in January, and moved to the Bandar Abbas area. In February, geological mapping of the Gutba structure was completed, and the Gulf Islands survey commenced on Qishm Island. This latter survey was completed in March. Work continued on other coastal areas, and was completed in May. From June to September, the landward boundary survey field party carried out work at the northwestern end of the boundary, in the Shiraz area and the southeast. In August geographical surveys were resumed in the Ahwaz plains and Bandar Abbas areas by reflection, seismic, and gravity methods respectively.

IRAN—Crude Production by Fields, 1958
(In Consortium Area)

Field	Average Rate of Production (Barrels Per Day)
Masjid-i-sulaiman	37,050
Lali	14,468
Haft Kel	143,890
Naft Safid	59,882
Agha Jari	503,011
Gach Saran	59,244
Totals	820,545

IRAN—NIOC's Sales of Oil Products
(Millions of Barrels)

	1957	1958	% Increase
Gasoline	2.90	3.28	13.0
Kerosine	4.45	4.71	6.0
Diesels	2.42	3.25	34.3
Fuel Oil	5.15	5.50	6.7
Other	.67	.97	44.5
	15.60	17.73	13.0



Drilling: Ahwaz No. 6 was drilled and bottomed at 13,210 ft in January 1959. It was plugged back to 8,725 ft in the Asmari, and will be put into normal production for a six-month trial. The well was completed in a 120-ft Asmari section at 8,645 ft to 8,767 ft, where it flowed 34.4-gravity oil at the rate of 16,000 b/d. In addition, it had been found capable of producing 10,000 b/d or more in the Cretaceous at 10,900 ft. This oil was heavier and had a higher sulfur content than any in the other Khuzistan fields.

Binak No. 1 reached a depth of 10,822 ft in July of 1959, and is being tested. It had very good shows of 24-gravity oil at 10,817 ft. Mand No. 2 was spudded in June, and had reached a depth of 3,000 ft in September 1959. Eight wells had been completed as producers up to the end of September 1959. They were Gach Saran (four); Agha Jari (two); and Naft Safid (two).

No. 1 Suru, the consortium's first wildcat at the eastern end of its operating area, was spudded nine miles northwest of Bandar Abbas. The consortium will spud a 15,000-ft test to seek deeper production in its shallow Masijid-i-Sulaiman field.

Operations by NIOC: The government of Iran has been actively exploring and carrying out an integrated oil operation through its State oil agency, National Iranian Oil Co. (NIOC).

IRAN—Ownership of Iranian Oil Participants Ltd.
(Iranian Consortium)

British Petroleum Co. Ltd.	40%
Royal Dutch/Shell Group	14%
Compagnie Française des Pétroles	6%
Standard Oil Co. (New Jersey)	7%
Standard Oil Co. of California	7%
Texaco Inc.	7%
Gulf Oil Corp.	7%
Socony Mobil Oil Co.	7%
Iricon Agency Ltd.	5%
Richfield Oil Corp.	1.250%
Signal Oil & Gas Co.	0.833%
Amer. Indep. Oil Co.	0.833%
Standard Oil Co. (Ohio)	0.417%
Getty Oil Co.	0.417%
The Atlantic Ref. Co.	0.417%
Tidewater Oil Co.	0.417%
San Jacinto Petrol Corp.	0.417%

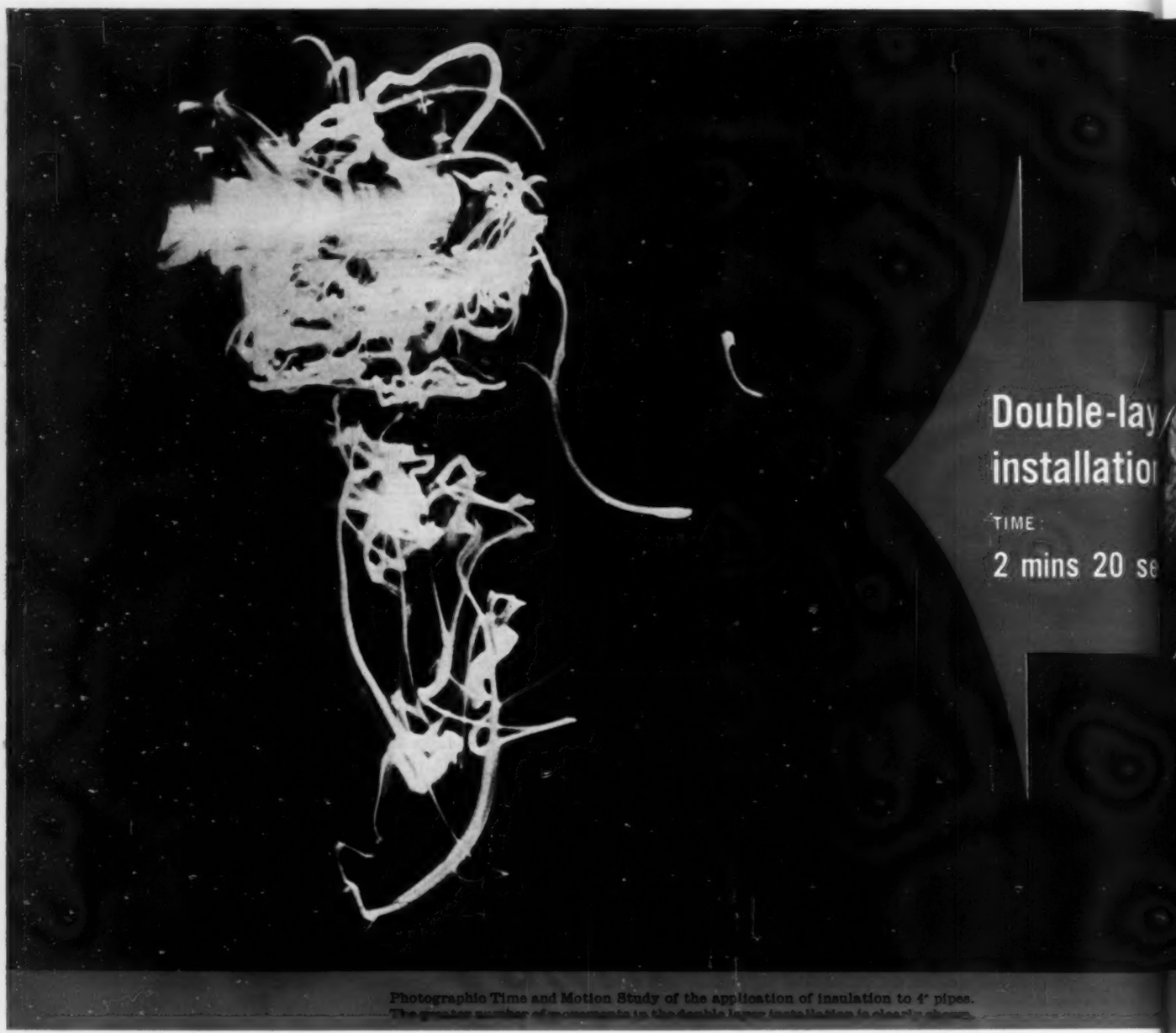
The company achieved its second successful strike during February 1959, when Serajeh No. 2 well reached a depth of 2,452 meters. Early tests showed that the open-flow potential of this well amounted to some 2,800 b/d of oil and 40,500,000 cu ft per day of gas. As usually, the producing zone was in the Oligomiocene stratum; and this well, together with Serajeh No. 1, has given indication that this field may be a very important one, according to NIOC. Serajeh No. 2 was continued to a depth of 2,617 meters. Two more wells were begun in the same area. Serajeh field is 60 kilometers southeast of the Alborz area and approximately 200 km south of Tehran. Attempts are still being made to find out more about the Alborz structure in the region some 140 kw southeast of Tehran. Alborz No. 8 was at 2,164 meters on June 30, 1959.

At Semnan, the drilling of Sorkheh No. 1 well was continued to 1,865 meters early in April 1959. Further geophysical work will be required before drilling is resumed in this area.

NIOC's development drilling is now limited to the Naft-i-Shah area, where it is planned to double production in line with the increase in the capacity of Kermanshah refinery. At the beginning of 1959, Naft-i-Shah No. 3 well was being drilled at 873 meters. Drilling was continued well into April, when the well was tested as a producer at 6,050 b/d.

On the northern flank of the Naft-i-Shah field, where no producer had been drilled, a location was selected for Naft-i-Shah No. 2 well, which reached 857 meters by the end of June.

PRODUCTION: During the first three years of consortium operations, definite commitments were made assuring the government of a rapid rebuilding of production to approximate the prenationalization level. The consortium has found it possible to exceed, by a substantial margin, the goal which it had set up. This is expressed in the following figures (in millions of barrels):



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Period	Program Quantity	% Increase	Actual Delivery	% Increase	% Actual Exceeded Program
1956	110.1		113.2		3
1957	172.9	57	190.0	68	10
1958	242.2	10	278.0	11	15
1959	259.5	10			

Projecting these figures, it was expected the consortium would lift about 296 million barrels in 1959, and that it would nominate about 283 million in 1960 with the hope of taking 327 million barrels.

REFINING AND MARKETING: Consumption of petroleum products in Iran is increasing at the rate of 15% annually. In 1958 Iran required about 18¾ million barrels of oil products. It is estimated that, in 1965, this figure will be 45 million barrels, and by 1975 nearly 150 million barrels per year will be needed.

The Abadan refinery of the consortium has a throughput capacity of about 514,000 b/d. In March 1959 the average daily runs were on the order of 342,000 bbl, most of which went to export. There is storage for 27,500,000 bbl of crude and products at the refinery.

NIOC's Kermanshah refinery can process 5,000 b/d of crude, and NIOC is now planning the early construction of a new 40,000 b/d unit in the vicinity of Tehran.

TRANSPORTATION: There is a 509-mile 10-in. pipeline from Ahwaz to Tehran with annual capacity of 18 million barrels, and 6-in. branch lines are being built to Isfahan (138 miles) and Resht (218 miles).

The government is tentatively planning a 320,000 b/d pipeline from Abadan to the Gulf, bypassing the Shatt-el-Arab River. It includes loading terminals, and total cost will be around $100 million. The project would take about three years to complete. It would avoid the disputes which have been going on between Iran and Iraq over tolls on the river, since the river would be bypassed completely.

Construction by the consortium of a 26-28-30-in. pipeline which will connect Kharg Island with the Gach Saran oil field, 99 miles away, was started on November 18, 1958. 28 miles of the line will be under water; the remainder will cross desert and broken, rugged terrain. The pipeline will have an initial capacity of 330,000 b/d, with gravity flow from the Gach Saran production unit (elevation 2,215 ft) to the Kharg Island crude-oil tank farm (elevation 200 ft).

Consumption: The domestic market for petroleum products in Iran is growing rapidly. Domestic sales of petroleum products amounted in 1958 to approximately 6% of the total oil produced.

Exports: During the year ended March 1958 about 41% of Iran's oil exports went to Europe, 22% to the Far East, 21% to Africa, 11% to the Arabian peninsula, 4% to the USA, and 1% to other areas, according to Iranian customs figures.

Crude oil is considerably more important in exports than products, the comparison in 1958 being 178.6 million barrels of crude to approximately 90 million barrels of products. Of the crude exports, about 2.2 million barrels were for the account of NIOC. The product exports were all on behalf of the consortium companies.

OIL LAWS

During 1959 there were published for the first time the verbatim texts of oil concessions in the Middle East. These include all the major agreements in Iran, in addition to the text of the oil law there; but, more important, the concession agreements for most other Middle East countries were included as well. They include the Saudi Arabian concessions of Aramco and Tapline; the Neutral Zone agreements; the Jordan concessions; the IPC, BPC, MPC concessions in Iraq; and many others—all material not available anywhere else. Provisions have been made for supplements to keep the original volumes up to date. The publication is *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* Requests for it should be sent directly to the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

No changes occurred in Iran's basic oil law, nor in the concession agreements governing company operations, during 1959.

NATIONAL FACTORS

Iran has proved to be one of the world's most productive oil areas, and investment favorability appears good as well. Much of the favorable investment climate may be ascribed to the government's realistic attitude, which has been clearly expressed by Mr. F. Naficy, director of exploration and production for the government's NIOC. He has outlined Iran's oil policy as follows:

> "The Iranian pertoleum legislation provides for any reputable operator, large or small, with (1) know-how (2) money, and (3) willingness to take a calculated risk, to enter into an agreement with NIOC in order to explore and/or develop independently, or in partnership with NIOC, the petroleum resources of an area commensurate with its ability to spend, while enjoying (1) complete security from political, legislative, fiscal, or other changes in working conditions; (2) full freedom of action in its operations; and (3) assurance of a generous return on its investment, if successful."

There exists considerable popular resentment of foreigners in Iran, as in most of the Middle East, but the consortium has been a less vulnerable target than the old Anglo Iranian Oil Co., perhaps due to its many-sided national character. There are difficulties in this aspect as well, especially in overemployment, but the political situation makes it impossible to reduce the Abadan staff.

Payments to the government by the consortium were 86,512,188 pounds (US $243,964,702) during the calendar year 1958. This was composed of the equivalent of a royalty of 12.5%, or 24,891,568 pounds, of which 23,256,100 pounds was in cash and the rest in oil; and income taxes of 61,620,620 pounds. In addition, the operating companies made payments on account of their own oil operations of about 1,700,000 pounds covering 1958 operations before March 20.

Despite a decrease in oil prices, payments made by the consortium on account of its operations in the first and second quarters of 1959, each approximating £22.3 million, were appreciably larger than the payments for the first two quarters of 1958. If this rate of payments were maintained through the next two quarters, the total for the year would be about £89.2 million, compared with the 1958 total of about £86.5 million.

IRAQ

EXPLORATION: A history of exploration is contained in *World Petroleum Report 1957*. This issue carries a summary of 1958 and 1959 activities.

During 1959 no major exploratory discovery was reported. The only development of note was a wildcat at Bai Hassan which tested an upper Cretaceous limestone at the rate of 2,000 b/d. The well, 25 miles west of the big Kirkuk producing trend, is a crestal location in a Mio-Oligocene limestone pay found at about 4,900 ft. All the shut-in wells are located on the flank of the structure. The test of Bai Hassan well 13 was by IPC, made of the interval between 4,270 ft and 4,430 ft, similar to the upper pay found in Ain Zalah to the north.

Activities by Iraq Petroleum Co.: During 1959 production rates from Kirkuk were increased from 25.7 m.t.a. (metric tons yearly) in April to 28.7 m.t.a. in August. Jambur field came on to export production towards the end of August, at a rate of 0.9 m.t.a. (about 18,000 b/d). Work is presently being carried out on further pipeline loops to increase pipeline capacity to a rate of 35 m.t.a. (about 700,000 b/d) in the early months of 1960.

A contract has been awarded for the construction of an additional 314 miles of 30-32-in. pipeline in Iraq. 249 miles will be laid in northern Iraq between Kirkuk and the Syrian border. The remaining 65 miles of line will be laid between Zubair and Fao (see BPC section following). The contract has been awarded to Turriff-Burden Ltd., of London. This pipeline project is part of the development program to expand capacity in Iraq to a rate of 57 million tons (about 1,140,000 b/d) by 1962 (35 million from the northern fields and 22 million tons from the BPC concession).

Activities by Basrah Petroleum Co. (BPC): 64 miles of pipe are to be laid between Zubair and Fao terminal, in southern Iraq. The 30-32-in. line will be laid along the route of the existing 24-in. line. Completion of the whole project was scheduled for year-end 1961. A deep water terminal is due to be completed at Fao, and a result of this building and the concurrent development of the Basrah oil fields, export capacity from the southern concession will be raised to 22 million tons a year from the former 12 million tons (19 million from Rumaila and 3 million from Zubair). The entire project, which includes development work, drilling, etc., at Rumaila, will cost £25 million.

PRODUCTION: During 1959 production averaged 850,800 b/d, a marked rise over 1958. Iraq Petroleum Co. is planning expansion which would bring its oil export capacity to 1.4 million barrels daily, compared to the 1,140,000 b/d scheduled by the end of 1961. The later boost would be made in northern Iraq, where IPC hopes to bring capacity to 960,000 b/d. Whether this is technically feasible will be determined

IRAQ—Well Data
(1927-1957)

Year	Wells Completed	Year	Wells Completed
1927	3	1942	—
1928	7	1943	—
1929	16	1944	5
1930	13	1945	7
1931	9	1946	4
1932	3	1947	8
1933	3	1948	7
1934	8	1949	15
1935	23	1950	22
1936	29	1951	16
1937	18	1952	14
1938	13	1953	19
1939	12	1954	17
1940	8	1955	15
1941	3	1956	14
		1957	14
		Iraq total	345

Note: For wells which have been deepened, the original completed drilling date has been used in assembling the above annual figures.

Type	No. of Wells
Oil	133
Gas	4
Observation	33
Plugged	175
Iraq total	345

while producing capacity is being brought up to the 700,000 b/d planned for 1961. The company plans to boost capacity of its Mediterranean pipeline system to 960,000 b/d.

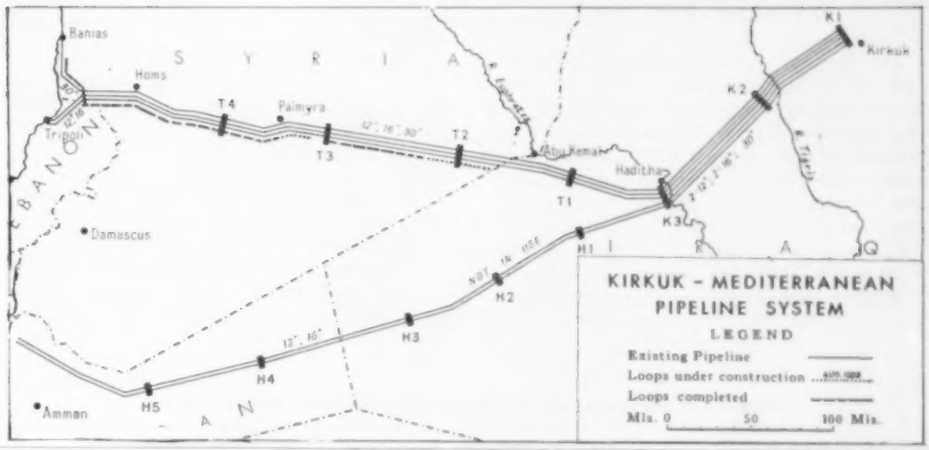
Under the program which IPC expects to complete in 1961, producing and export capacity of the southern fields also is being jumped to 440,000 b/d from the present 240,000 b/d.

REFINING: The addition to the Daura plant has been completed. *See World Petroleum Report 1959* for other refining plans.

OIL LAWS

During 1959 the oil concessions of IPC, BPC, and MPC were published *in toto* in a highly recommended new source, *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* It is published by *Petroleum Legislation, Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* The oil concessions of the other major Middle East countries are contained also, the first time most of these have been published.

No major changes occurred in oil laws during 1959. Law No. 37 set up a General Committee for Oil Affairs in mid-1959. The committee is charged with drawing up general policy for oil, which policy includes: supervision of present oil concessions, and amendment of the concessions; opinion on the grant of new oil concessions, and taking part in laying down of such concessions on their amendment; specifications for local and imported oil products; opinion on agreements concerning oil pipelines crossing Iraq, and taking part in discussions about oil pipelines; research and studies relating to oil affairs; operations for oil research, production, refining, purchase, sale, transport, and distribution; imports of oil products and exports of crude oil and derivatives; preparation of products for industrial uses; fixing of oil-product prices; establishment and management of all the various oil installations throughout the republic; production or manufacture of any matter essential to the oil industry and sale; undertaking all necessary and beneficial works required for realizing the objects of the committee; raising loans within the limits prescribed by the Council of Ministers.



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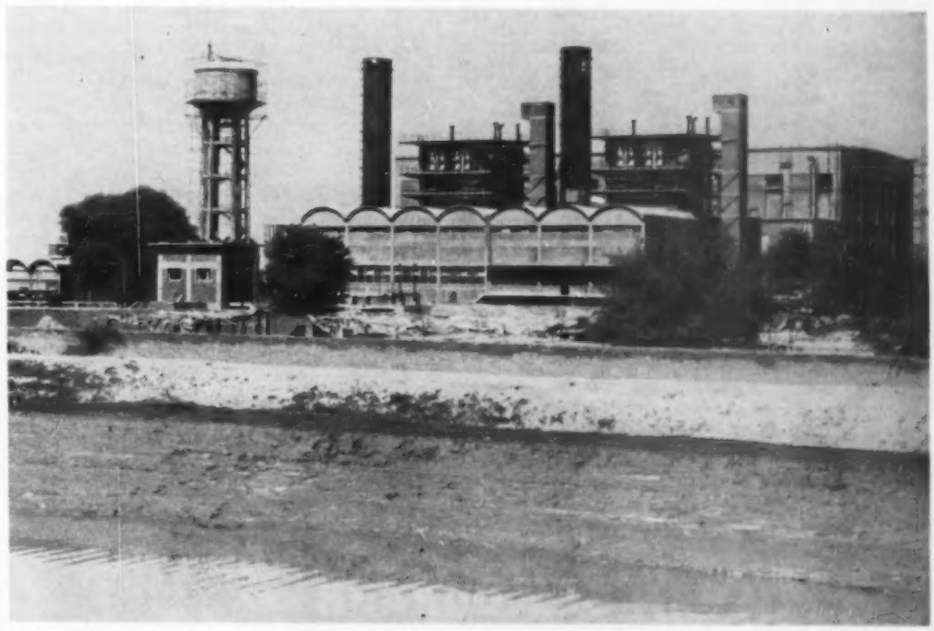

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NATIONAL FACTORS

The political situation remains precarious and serious. The government of Premier Abdel Karim Kassem is threatened, especially by the communists who provoked the statement from the premier that "we shall settle accounts." Two assassination attempts were made in late 1959, and a number of army officers have been arrested for abortive revolts.

The government received record oil revenues in 1958 of $234,674,884 on total production of 33,255,294 tons. This is equivalent to roughly 94¢ per bbl (at 7.5 bbl to a ton). 1959 revenues are estimated at $240.8 million (86 million pounds).

Offer of a 90-10 arrangement, giving the government of Iraq 90% of oil profits, was made by the Russian delegation when it was in Baghdad. Area affected is the proposed surrender by IPC's subsidiary, Basrah Petroleum Co. It lies offshore, with limits not yet determined.

Khanaqin Oil Co., BP subsidiary, handed over its marketing operations to the Iraqi government, June 30, 1959; the company relinquished its exploration and production rights in northeast Iraq in 1958. Khanaqin is to continue operating BP's avaiation service within Iraq and market certain specialty oil products.

Labor unions will be formed in Iraq's oil industry for the first time by authorization of the Minister of Social Affairs. Headquarters will be in Baghdad, with branches in the northern and southern oil centers.

IRAQ—Wells Completed and Footage Drilled, 1959
(Jan. 1-Sept. 30)

	IPC	BPC	MPC
Oil	6	—	1
Gas	—	—	—
Dry or Abandoned	2	—	2
Observation	—	1	—
Water Injection	4	—	—
Total footage	44,819	26,503	17,449

IRAQ—Looplines Paralleling the 30-32-in. Mediterranean Pipeline in Syria

Distance in Miles From K.1	Length and Diameter	Construction Period
249-265	16 miles of 30"	July 1959-
265-292	27 miles of 30"	January 1959-October 1959
292-301	9 miles of 30"	November 1958-April 1959
301-318	17 miles of 30"	September 1957-January 1958
318-360	42 miles of 30"/32"	August 1958-August 1959
360-372	12 miles of 30"	September 1959-
372-385	13 miles or 30"	July 1959-October 1959
385-410	25 miles of 30"/32"	June 1958-December 1958
410-466	56 miles of 30"/32"	November 1957-June 1958
466-494	28 miles of 24"	August 1957-October 1958
494-534	40 miles of 24"	August 1958-May 1959

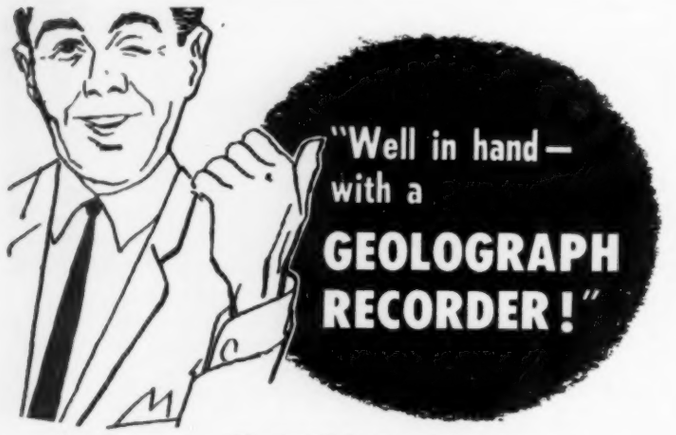
IRAQ—Exploration Drilling, 1959

		Drilling Period	Depth at 30-9-59 (Feet)
IPC	Gilabat 1	Oct. 1956-Sept. 1958	*6,547
	Pulkhana 1	Aug. 1956-Aug. 1959	*9,500
BPC	Samawa 1	Aug. 1958-	11,719
	Tuba 1	Mar. 1959-	10,788
	Kifl 1	Aug. 1959-	798
	Dujaila (location)		—
MPC	Anah 2	May 1958-Mar. 1959	*11,573
	Khleisia 1	Aug. 1958-	*12,438
	Samarra 1	July 1959-	4,157

*Abandoned.

YEMEN

A concession was granted in late 1959 to American Overseas Investment Corp., a USA group headed by W. Angie Smith III, of Oklahoma City, a former State Department official. Other board members include W. McKeever, J. H. York, T. E. Purvis, and A. P. Utterback, of Fort Worth; and Smith's brother, Shelby Smith of Shreveport, La. The concession covers a 10,0000-square-mile area on the northwest coastal plain and the offshore coastal waters. It reportedly calls for a 50-50 division of net profits.



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ISRAEL

EXPLORATION: The first bloom has definitely gone from Israel's oil hunt. As reviewed in previous issues of *World Petroleum Report,* only one small oil find has been made—the Heletz field. During 1959 the principal event was the discovery of natural gas in what appeared to be commercial quantities in the Arad license of the northern Negev Desert. It is estimated by the government that production will be about nine million cubic feet daily. A core from Sohar No. 2, the discovery well, indicated methane in the lower Cretaceous, the formation which yielded gas in the discovery well. Naphtha-Israel Petroleum Corp. bottomed the stepout at 3,670 ft. Sohar No. 1, 100 ft to the west, tested 500,000 cu ft daily. Twenty more development wells are planned. If the field holds up, the gas could be transported to Beersheba or used in nearby potash works. Reserves are estimated by the company at 50 billion cubic feet.

Denver-Golden Oil and Uranium Co. drilled a dry exploratory well on properties held by Pan-Israel Oil Co. Inc. and Israel-Mediterranean Petroleum Inc. The companies have since pulled out of the country.

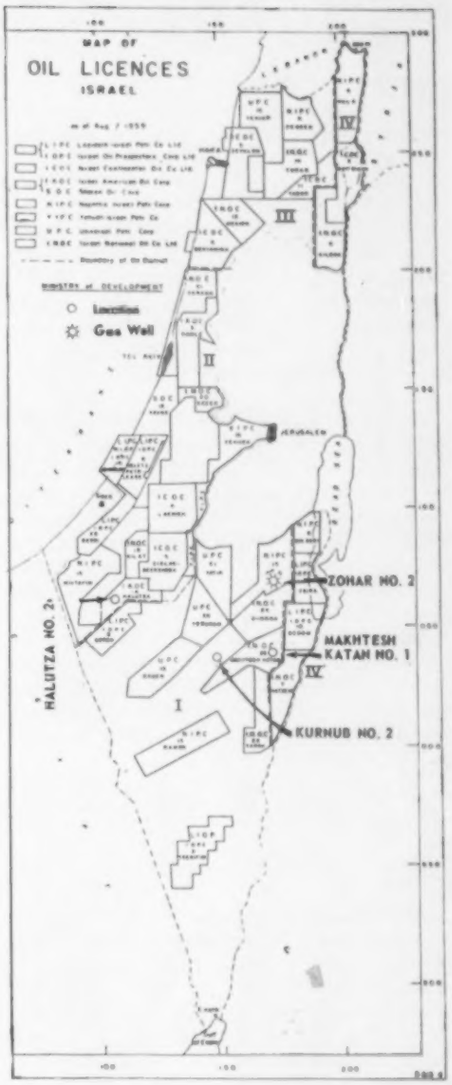
PRODUCTION: During 1959 production of crude petroleum, all from the Heletz field, averaged slightly over 2,000 b/d. Mazada, the producing company, now hopes to hold production at around 2,200 b/d, supplying around 8% of domestic needs.

TRANSPORTATION: Much activity in pipeline negotiations went on during 1959.

Principal news was the signature of a new concession agreement with a group of investors headed by Baron Edmond de Rothschild. Under a concession signed with the Israel government on July 17, 1959, the international investment group will own and operate a 16-in. pipeline from Eilat on the Red Sea to Haifa on the Mediterranean, a distance of 257 miles. One section of the 16-in. line, a 122-mile stretch between Beersheba in the Negev and Haifa, is already in existence; while the 135-mile section from Eilat to Beersheba, which at present has an 8-in. line, will have the 16-in. line now under construction completed by July 1960. At that time the Eilat-Haifa line will have an annual capacity of 1,700,000 tons (35,000 b/d). The planned installation of additional pumping and storage facilities will increase this capacity to 2,900,000 tons (58,000 b/d) by March 1961; and, if sufficient domestic and/or transit business develops, it can be further stepped up to a total of 5,800,000 tons a year (116,000 b/d). Under a guarantee by the Israel government, the minimum annual return on the outstanding investment will be 8%.

MARKETING AND REFINING: Israeli authorities are looking into possible expansion of the 80,000 b/d Haifa refinery to increase Israel's product export potential. The plant is currently operated at only about a third of capacity. Paz Ltd., a British-owned firm controlled by department-store magnate Isaac Wolfson, bought the refinery late in 1958 from Shell and British Petroleum. Paz had previously purchased their joint marketing interests in Israel.

No oil from Arab countries is available to Israel under the tight Arab boycott, but the Israeli government has reportedly made purchases of crude from the Iranian government's National Iranian Oil Co., which is believed to be the sole supplier of the oil which has been flowing steadily through the present line from Aqaba. If buyers are found, exports from Haifa could be started in 1961—if not earlier—under the pipeline time table. Though there is no obligation for crude throughput above the guaranteed domestic 30,000 b/d level, this means that Tri-Continental would have at least minor export capacity in 1960, and possibly 25,000 b/d or more in early 1961.



ISRAEL—Exploration Drilling, 1958

Operator	Well	License	Date Spudded	Date Completed	Total Depth (Feet)[1]	Bottomed in	Remarks
L.I.P.C. & I.O.P.C.	Heletz 22	II/8	8.3.57	29.8.58	14,689	Jurassic	Producing from Lower Cretaceous
L.I.P.C. & I.O.P.C.	Sinaf 1	I/3	25.3.57	8.2.58	5,292	Paleozoic	dry
Y.I.P.C.	Motza 1	II/18	3.4.57	24.6.58	8,209	Jurassic	dry
N.I.P.C.	Zohar 1	I/15	18.6.57	3.7.58	6,562	Triassic?	Gas in Jurassic
I.C.O.C.	Devorah 1	III/11	11.11.57	30.1.58	3,590	Jurassic	Oil show encountered
L.I.P.C. & I.O.P.C.	Saad 1	II/7	3.6.58	25.8.58	7,810	Jurassic	dry
P.I.O.C. & I.M.P.I.	Hulda 1	II/9	21.8.58	11.11.58	7,398	Jurassic	dry

Source: AAPG Bulletin, July 1959.

ISRAEL—Drilling, 1959

Operator	Well	Depth (Feet)	Location	Remarks
L.I.P.C. & I.O.P.C.	Sinaf 1	5,126	Southern Negev	Dry
" "	Heletz 22	9,741	Heletz oil field	Producing Oil
Y.I.P.C.	Motza 1	4,606	Judean Hills	Oil shows
N.I.P.C.	Zohar 1	4,866	Northern Negev	Gas
	Zohar 2	4,000	" "	"
	Zohar 3	4,000	" "	"
	Zohar 4	4,000	" "	"
I.C.O.C.	Devera 1	1,920	western Gellile	Oil shows
I.C.O.C.	Jordan 2	1,500	Gallile Sea	Dry
N.O.C.	Machtesh Katan 1	2,500	Southern Negev	Dry
	Machtesh Katan 2	7,200	" "	Oil & gas shows
	Arava	9,000	" "	Suspended
	Afik	5,000	Ashkelon	Drilling

OIL LAWS

During 1959 a publication appeared which is highly recommended as a source for those interested in oil operations in the Middle East. It contains the original concession documents for most countries of the Middle East *in toto,* in word-for-word English translation. This is the first time, so far as is known, that such documents have been published. They are contained in two volumes which are kept current by supplements designed to maintain the collection up to date. Title of the publication is *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts),"* and it is available from the publisher, *Petroleum Legislation Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Requests should be sent directly to that address.

No changes in oil laws occurred during 1959. The oil law is summarized in previous issues of *World Petroleum Report,* particularly in the 1957 edition.

NATIONAL FACTORS

No major change occurred in the national factors affecting investment favorability during 1959. For a review of these factors, see previous issues of *World Petroleum Report.*

JORDAN

EXPLORATION: The only exploration being conducted is by Phillips Petroleum Co., a USA company from Oklahoma. Despite five exploratory wells, no discovery has been made as yet on the concession which was obtained from Pauley Petroleums. For a résumé of the concession's terms, see *WPR 1958*. Wells drilled so far are listed in an accompanying table. Phillips has temporarily halted operations until its new concession extension is signed.

On September 17, 1959, the Council of Ministers approved a request by Phillips Petroleum Co. for an extension of its exploration concession.

According to press reports, the Jordanian government on February 9, 1959, cancelled the oil exploration concession granted to George Izmiri because he had failed to meet obligations under the agreement signed with him on November 28, 1957. The Ministry of Economy said he had not defined the exploration area nor paid his commitments, of which a second installment was due on November 13.

The Jordanian Ministry of Economy stated, on March 14, 1959, that the government had recently received offers from three USA, Italian and West German oil companies to negotiate oil exploration concessions in Jordan.

JORDAN—Drilling

Well	Location	Total Depth (Feet)	Results
Safra No. 1	26 miles ESE of Amman	8,472	D&A 12-14-57
Ramallah No. 1	45 miles W of Amman	10,399	D&A 6-14-58
Halhul No. 1	50 miles SW of Amman	6,010	D&A 1-10-59
Suweileh No. 1	10 miles NNW of Amman	7,637	D&A 5- 7-59
Jordan Valley No. 1	20 miles SW of Amman	3,600	D&A 5-16-59

D&A—Drilled and abandoned. **Note:** No well drilling at end 1959.

PRODUCTION, REFINING, MARKETING: There is no crude production, and no refining, although a refinery is reportedly under construction 15 miles north of Amman, the capital (see *WPR 1959*). Under an agreement with Tapline, known as the "crude commitment" agreements of 1952, Jordan (as well as Syria and Lebanon) has the right to purchase, under specified conditions, up to 200,000 tons of crude per year from Tapline.

OIL LAWS

During 1959 the concession contract of Edwin Pauley was published in *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* This publication contains, in addition, most other concession documents of the Middle East. It is a highly unusual and informative service which is recommended for companies and students in the area. It is available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

Some relevant factors are discussed in *WPR 1959*. The régime of King Hussein remains stable, despite some tremors during 1959 occasioned by the resignation of Premier Samir Rafai. His departure was welcomed by the Beni Sakr officers, the most important tribal group in Jordan's Bedouin-oriented army. The Bedouins are the chief support of King Hussein.

The problem in Jordan grows daily more acute. The country is not self-supporting, and probably never will be. USA aid has supported it, but the high refugee element and lack of resources make the country permanently dependent on outside help. The situation is apparent from Jordan's budget. Income is estimated at JD 30.8 million, of which about JD 9 million is to come from internal sources and the remainder from foreign assistance, mainly from the United States. The excess of estimated expenditure over revenue (about JD 7.4 million) is expected to be financed mainly from expanded USA assistance.

KUWAIT

EXPLORATION: Kuwait Oil Co.'s Minagish, 21 miles west of the Burgan oil field, tested about 34.5° API gravity oil at 10,030 ft, and a Ratawi interval produced 10,000 b/d of 34.8 gravity oil with a flowing pressure of 600 psi. Sulfur content is 1.90% by weight. The well was deepened to 11,614 ft to investigate production possibilities in the underlying Arab Zone limestones, then plugged back. A second well is now drilling.

Two other wells were drilled by KOC. Dibdibba 1, approximately 25 miles northwest of Minagish 1, was dry in 1959 at 9,438 ft. Mutriba 1, in northern Kuwait, about 28 miles west of Raudhatain, has been drilled to 11,516 ft. Operations continue to explore horizons below the Zubair formation.

PRODUCTION: During 1959 production averaged about 1,395,000 b/d, the highest level in the Middle East. While ultimate recovery expectations are high, the company is installing one of the largest gas-compressor plants in the Middle East at Burgan, to be in operation early in 1960.

Raudhatain development is one of the outstanding events of 1959. A likely reserves figure of 9.75 billion barrels can be calculated for Raudhatain. This field was scheduled to be brought into production late in 1959.

Crude-producing capacity in Kuwait rose in 1959 with the opening of two new gathering centers in Burgan field. Each of the stations can handle 180,000 b/d. KOC planned in 1959 to step up its current output to a possible 1.7 million barrels per day. This would include added production from southern Kuwait where another gathering center was commissioned, making 14 in all for southern Kuwait. Loading capacity at the Mina al Ahmadi oil port was boosted to 2½ million barrels per day, with completion of a new pier in June 1959.

Reserves: Total proved reserves within Kuwait proper, not including the Neutral Zone, are estimated by *World Petroleum Report* at 58 billion barrels. This is a very conservative estimate. Some industry sources estimate reserves at 90 billion barrels.

TRANSPORTATION: Initial production facilities in North Kuwait were completed in mid-1959, according to Kuwait Oil Co. These facilities include a collecting and a pump station in the field, and a 30-in. transit line from Raudhatain to the Ahmadi tank-farm area, a distance of some 80 miles.

The North Pier is nearing completion, together with three new 38/40-in. gravity lines connecting with the North Tank Farm. These will permit loading up to 50,000 bbl per hour, and the 5-berth pier will be able to handle two 50,000-ton and two 100,000-ton tankers simultaneously.

REFINING: There is one refinery in Kuwait, the 190,000 b/d plant belonging to KOC at Mina al Ahmadi. (For refineries of Neutral Zone companies, see that section.) A Platformer was added in 1959 to raise the octane rating of motor gasoline to meet a fast-growing local demand. A 200 b/d LPGas plant currently is being installed to meet the Kuwait local market requirements for LPG.

MARKETING: Kuwait Oil Co. exported 465,004,370 bbl of crude oil during 1958, with the United Kingdom the largest single destination. Product exports for the year were 21,469,855 bbl. Crude oil exports by the Kuwait Oil Co. in the first 9 months of 1959 came to 339.9 million barrels, compared with 342.5 million barrels a year earlier. Exports of all products in the first 9 months were 21.77 million barrels, compared with 13.35 million a year earlier.

OIL LAWS

During 1959 an important publication appeared. It contains the original texts of most of the Middle East concessions. The original text of the Kuwait Oil Co. concession is included in an extremely detailed summary taken directly from the original documents, while the remainder of the documents in the publication are word-for-word. Title of this publication is *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* It may be obtained from the publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* All inquiries should be sent to that address.

No important changes occurred in the basic concession agreement governing Kuwait's oil development. For a summary of that agreement, see *World Petroleum Report 1957*.

NATIONAL FACTORS

Revenues of Kuwait will probably not be affected seriously by the new curbs on oil imports to the USA. Kuwait Oil Co. stands to feel only slight loss of markets by the program, as only 73.7 million barrels of its crude-oil exports of 465 million barrels went to the USA in 1958.

KOC's exports of products will be affected more, as the company exported in 1958 5.7 million barrels of light distillate to the USA. If the USA market for this is virtually eliminated, KOC plans to blend the surplus with its crude or fuel-oil exports, or return it to the wells. KOC has no plans to reduce operation of its refinery, which has been operating at 120,000 b/d against a capacity of 190,000 b/d.

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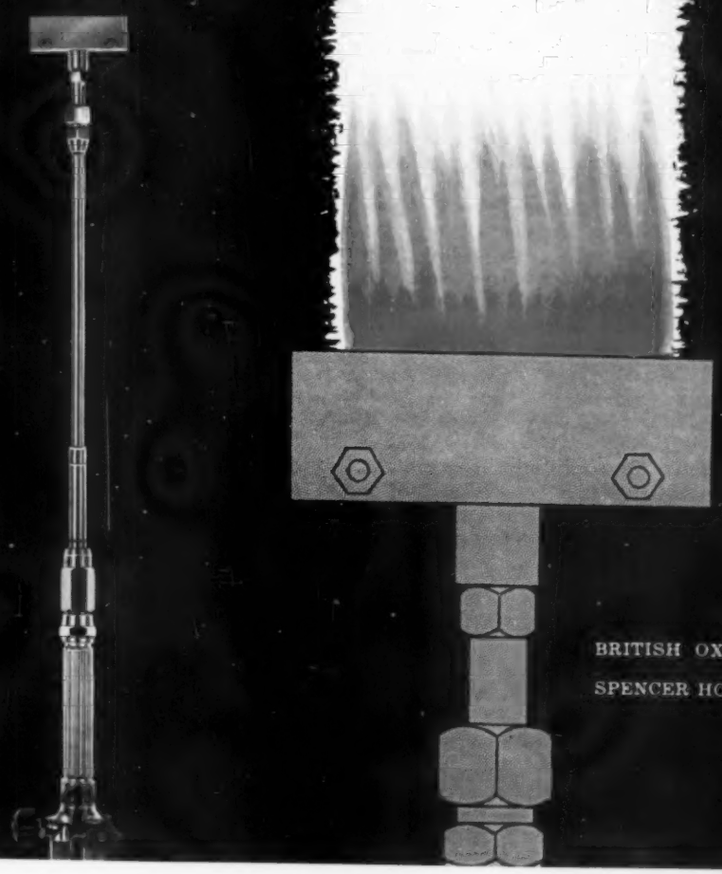

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LEBANON

EXPLORATION: The principal concessionaire remains the Cie. Libanaise des Pétroles (see *WPR 1957* for map of holdings and *WPR 1959* for company description). During 1959 Gewerkschaft Elwerath, a West German producer, took up a 50% interest in the 75-year concession held by Cie. Libanaise des Pétroles. Elwerath, in which Jersey Standard and Shell hold minority interests, will hold 40,000 shares in CLP. Total shares were increased to 80,000, with about 11,000 issued free to the government, giving it 13.75% participation.

PRODUCTION, REFINING, MARKETING: There is no production as yet, and only two small refineries—one owned by Iraq Petroleum Co. at Tripoli (11,500 b/d capacity), the other owned by Mediterranean Refining Co. at Sidon (50% Socony Mobil, 50% Caltex). The Sidon refinery has 12,500 b/d capacity, including 1,400 b/d reforming. See Oil Laws hereinafter for recent refining agreements.

Marketing needs total about 20,000 b/d, and are supplied mainly by the two refineries, although some specialized products are imported.

TRANSPORTATION: Lebanon is crossed by two very large pipeline systems. One of them belongs to Tapline, owned by the parent companies of Aramco; and the other by IPC. Tapline has 420,000 b/d capacity and delivered an average of 348,600 b/d of crude to its Sidon terminal during the first eight months of 1959. IPC has a higher capacity, estimated at about 720,000 b/d; but actual deliveries in 1959 are not known.

OIL LAWS

During 1959 the oil laws of Lebanon, together with the concession contract of the Cie. Libanaise des Pétroles, were published in an unusual series of volumes entitled *"Middle East—Basic Oil Laws and Concession Contracts."* In addition to the Lebanese material, the publication contains the original of Aramco's concession, as well as that of Tapline, IPC, Pacific Western (now Getty Oil Co.), and many others never before published. It is available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* All inquiries should be sent to that address.

Negotiations concerning the transit agreements of the pipeline companies have dragged on for years, and during 1959 agreement was finally reached with IPC, although no agreement with Tapline has been possible as yet. The Lebanese government and Iraq Petroleum Co. jointly announced in June that three separate agreements had been concluded dealing with crude transit in pipelines across Lebanon, loading of crude at the Tripoli marine terminal, and with the Tripoli refinery.

Total company payments after loading of 7½ million tons of oil annually amount to 1,235,000 pounds sterling. When the agreements are ratified, the government will receive from the company a lump sum of 5,818,000 pounds sterling in settlement of all government claims on the company for the past. 20% of all product supplies from the Tripoli refinery for Lebanese consumption will be available to Lebanese marketers nominated by the government. The company will establish a technical trade school in Tripoli, and will provide 35,000 Lebanese pounds a year to be distributed among municipalities in which the company is operating.

IPC paid the Lebanese government £2,250,000 sterling in August as a first installment in settlement of all past claims for oil-transit royalties. The government is expected to use this sum to finance various development projects.

NATIONAL FACTORS

Political stability has resumed under the government of President Chehab, and traditional belief in private enterprise is continuing. There are no restrictions of any kind on import or export of currency. Income tax ranges up to 42%, with exemption for six years to certain industries.

NEUTRAL ZONE

EXPLORATION: A brief history of exploration is given in *World Petroleum Report 1957*. No exploration was done onshore during 1959, but one offshore well was begun by Japanese concessionaires (see *WPR 1959* for a comparative concession summary). The well caught fire during 1959, and blew out as a gasser. It was finally extinguished, but about $1 million in damage was done and drilling operations only got under way again toward the end of 1959. The blowout excited Japanese interests who feel sure they have a potential discovery.

The Japanese company, Arabian Oil, planned to complete its first well, if possible, by March 1960. The company plans to ship 200,000 b/d to Japan by 1964, although no discovery has been made as yet.

PRODUCTION: All production is from onshore, where Getty and Aminoil companies are producing from the Wafra field. During 1959 production averaged 114,200 b/d, compared with 80,300 b/d in 1958. This production is divided between the Aminoil and Getty companies, the two concession holders; and during 1958, according to Getty's annual report, Getty obtained for its own account from the Neutral Zone an average of 43,760 b/d, as compared with 1957 liftings of 38,298 b/d.

American Independent Oil Co., holding an undivided one-half interest, is owned as follows: Phillips Petroleum Co., 33.54%; Signal Oil & Gas Co., 30.16%; Ashland Oil & Refining Co., 12.70%; Ralph K. Davies, 6.98%; J. S. Abercrombie, 6.35%; Crescent Corp., 3.17%; Sunray Mid-Continent Oil Co., 2.65%; Globe Oil & Refining Co., 1.59%; Lario Oil & Gas Co., 1.59%; Pauley Petroleum Inc., 1.27%. Getty Oil Co. (also holding an undivided one-half interest) is owned as follows: J. Paul Getty interests, 81%; others, 19%.

Reserves: In March 1958, DeGolyer & MacNaughton estimated reserves in the Wafra and Fuwaris structures at 13.5 billion barrels—a considerable jump from previous estimates.

REFINING: There are two refineries: a 50,000 b/d plant owned by Getty, and a 30,000 b/d plant owned by Aminoil. Getty's new plant operated below capacity during 1959 due to a cutback in its shipments to the United States.

OIL LAWS

During 1959 an important publication appeared which, for the first time, contains the original texts of the concessions governing operations in the Neutral Zone. It includes also those of Getty, Aminoil, Japan Petroleum Trading Co., and Arabian American Oil Co. Ltd., etc. The publication is entitled *"Middle East—Basic Oil Laws and Contracts (Original Texts)."* It is available from the publisher: *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

No changes occurred in the basic concession agreements during 1959. Getty Oil Co. issued its annual report for 1958, in which it gave the following description of its payments to the government under its concession agreement:

> "The Company is paying to the Kingdom a royalty of 55¢ per barrel on one-half of the total production of crude oil in the Neutral Zone, and has paid to the holder of the other undivided one-half interest a royalty of approximately 37¢ per barrel on all of the Company's liftings in excess of one-half of total production to September 30, 1958. This latter payment will be repayable to the Company from time to time as the holder of the other undivided interest has liftings in excess of one-half of total productions, until its underliftings to September 30, 1958, have been made up, and the Company will simultaneously pay royalties to the Kingdom of 55¢ per barrel on such excess liftings of the other holder. Therefore, the Company has accrued in its accounts for royalties at 55¢ per barrel on all of its crude-oil liftings to December 31, 1958. Such royalties amounted to $9,018,447 for the year 1958.
>
> "Under the terms of the concession agreement, the Company has also agreed to pay to the Kingdom of Saudi Arabia 25% and 20%, respectively, of any 'net profits' (as defined) realized from the sales of crude oil and refined products obtained by the Company from the Neutral Zone. The share of the Kingdom in such 'net profits' is to be in the nature of a 'carried interest' and shall be determined in accordance with oil accounting practice accepted as standard in the Mid-Continent oil-producing area of the United States. No amounts have been required to be paid under this provision of the concession agreement to December 31, 1958, since the Company has not yet recovered through earnings, under standard 'carried interest' accounting practice, the cost of its investment in Neutral Zone producing oil properties. The Company in 1958 made a provision of $1,152,000 in its accounts for future 'carried interest' payments at the applicable percentage of recorded profits, for the year ended December 31, 1958, net of federal income taxes at a 52% rate. A reserve for 'carried interest' net of income taxes, applicable to years prior to 1958 has been recorded in 1958 by transferring $1,157,780 from the reserve for depletion, depreciation, and amortization of foreign producing properties. This transfer also represents the overstatement in the reserve for depletion, depreciation, and amortization which resulted from new and higher estimates made in 1958 of recoverable oil reserves in the Neutral Zone."

NATIONAL FACTORS

Some of the difficulties confronting the Neutral Zone companies became more apparent during 1959 and early 1960. The Japanese-owned companies are already worrying about outlets for their oil which may be produced offshore. They will have grave difficulty in cutting into markets, without established marketing facilities, during the present crude surplus. After oil is found, they are required to establish joint

companies with Arab interests in the Middle East which will supervise marketing of the oil. Some more problems are going to arise in the administration of these companies.

The onshore producers have their own problems. Prices were cut during 1959 to the lowest posted price level in the world, and the closing of the export market in the USA has been a hard blow. Aminoil (American Independent Oil Co.) is in a bad position. While only 14% of its crude exports went to the USA, 91% of its fuel oil went to the USA in 1958, and this is the sole marketable product of its refinery. The company must find an entirely new marketing area or severely restrict its refinery output.

Getty Oil Co. exported almost 94% of its crude and 99% of its refined fuel oil to the USA in 1958. A cut in exports to the USA is reflected "almost precisely in Getty total sales." But Getty has tried to line up additional refineries in Europe which might take some of the surplus.

QATAR

EXPLORATION: Only one exploratory well was drilled during 1959, i. e., the Dukhan 1 well, spudded in July 1958 to test deeper horizons in the Dukhan producing field. The entire country is held under concession by Qatar Petroleum Co. (QPC), as covered in previous issues of *World Petroleum Report*.

Efforts to find other oil-bearing structures in Qatar have so far proved disappointing. Two tests drilled in the center of the peninsula, Kharaib 1 and 2, in 1952 and 1953, found the Arab zones productive at Dukhan to be water-bearing. QPC estimates the cost of the 16,500-ft. deep Dukhan 1 test at more than $4 million. It may represent a last-ditch try for deep production on Qatar's best oil structure, but QPC can always plug back to the No. 4 limestone and make a standard Dukhan producer out of its expensive wildcat if it finds nothing better.

Important exploration is being done offshore (see *WPR-1959* for summary of previous interest in the area). Shell Co. of Qatar Ltd. received a concession over the offshore waters of Qatar some years ago, and drilled two wells before its platform was destroyed by a storm in December 1956. The company has towed a new drilling platform from Europe, and drilling operations will be under way again during early 1960, if plans work out.

PRODUCTION: The average rate of increase has slowed in Qatar with the years. During 1959 production averaged 170,000 b/d, which seems about its maximum. Dukhan field has 48 producing wells spaced along the 40-mile anticlinal structure, and the field accounts for a about 174,000 b/d average production. The No. 3 limestone pay averages 83 ft thick, and is found at about 6,000 ft throughout the field. The No. 4 is 185 ft thick, and is found 500 ft deeper.

The shallower limestone production showed a marked pressure decline; so completion in this pay were suspended in 1952. The bulk of Dukhan's production comes from the thicker No. 4 limestone where there has been no appreciable pressure drop.

An even deeper Jurassic limestone, the Uwainat, was found at about 7,500 ft in 1954, and so far three observation wells have been completed in this formation.

The No. 3 limestone produces at 800 psi wellhead pressure, with a 700:1 gas-oil ratio. The well-head pressure on the No. 4 wells averages 1,450 psi, with a 1,200:1 ratio.

REFINING, TRANSPORTATION, MARKETING: There is only one refinery, a small 600 b/d topping plant at Umm Said which supplies local needs. The pipeline transportation system consists of two main lines from the field to Umm Said (see map in WPR *1957*.) Three separation stations, each with a series of horizontal separators, process the crude before it is moved into the pipeline system at Umm Bab for pumping to the Umm Said terminal. The first 14 miles of the pipeline system eastward from Umm Bab are two parallel 14½-in. lines on the surface. The final 35 miles of the system consist of a single 20-in. buried line terminating at the Umm Said tank farm. The 16 storage tanks, just four miles from the loading terminal, have a working capacity of slightly less than 2,000,000 bbl of crude.

OIL LAWS

The principal concessions are those of the Qatar Petroleum Co. Ltd. and Shell Co. of Qatar Ltd. Text of neither concession has been released, and only very general information concerning them is available.

SAUDI ARABIA

EXPLORATION: Arabian American Oil Co.'s usual total of eight exploration parties worked in the outlying parts of the concession area during the 1958-59 field season. Effort continued to be concentrated primarily in the Rub'al-Khali region, with three seismograph and three structure-drill parties working in that remote "Empty Quarter." Outside the Rub'al-Khali, the fourth party of each type was operating in more northerly areas.

Drilling: During the 10 months ended October 31, 1959, Aramco completed 17 deep wells, including eight with the status of potential producer: five in the Khurais field (No. 4, 5, 8, 10, and 11); two in the Khursaniyah field (No. 7 and 8); and No. 3 in the Manifa field. Of the remainder, two were on observation as of October 31, 1959—Ghawar-Fazran No. 3 and Manifa No. 4—while the following had been abandoned: Ghawar-Fazran No. 4 (converted to a water well) and No. 5; Khurais No. 7 and 9; and Khursaniyah No. 6. Two wells at Ghawar-'Ain Dar were completed for gas injection.

Offshore drilling was done only in the Manifa field. Discovered in 1957, this was the second offshore field in the Persian Gulf. The discovery well was completed in the Lower Ratawi zone, which is productive also in the Neutral Zone and has been identified as Lower Cretaceous. This was the first well in Aramco's concession area to have discovered production from this zone, which lies below the Cretaceous Bahrain zone (productive offshore at Safaniya) and above the Jurassic Arab zone (the principal producing zone in Aramco's onshore fields). The crude has a gravity of 27 API. Since that time, Manifa No. 2, located nine kilometers south and three kilometers east of the discovery well, was completed in 1958 in the Upper Ratawi zone; and Manifa No. 3, six kilometers west of the discovery well, was completed in 1958 in the Manifa zone—lying between the Ratawi and the Arab zones. The drilling at Manifa has also resulted in the discovery of oil in the A, B, and C members of the Arab zone. Another delineation well, Manifa No. 4, located about 9.5 kilometers southeast of No. 2, did not contain oil in any of the formations which had been productive in the other wells. All of the Manifa wells since No. 1 have been drilled with the use of the three-legged LeTourneau mobile platform in conjunction with the drilling barge "Queen Mary."

Pressure Maintenance: The new $30 million gas-injection plant in the 'Ain Dar area of the Ghawar field went into operation in March 1959. Built 30 miles west of Abqaiq, the plant has a capacity of 210 million cubic feet per day. Gas is gathered from five gas-oil separator plants

SAUDI ARABIA—Status of Wells
(As of September 30, 1959)

Field	Producing	Shut In or Standing	Observation	Injection	Suspended	Abandoned	Drilling	Total
Abqaiq	57[1]	6	3	12[2]	0	2	0	80
Abu Hadriya	0	1	1	0	0	2	1	5
Dammam	27[3]	4	1	0	0	10[4]	0	42
Fadhili	0	1	0	0	0	0	0	1
Ghawar:								
'Ain Dar	40	10	3	6[5]	1	1	0	61
Shedgum	14	1	1	0	0	1	0	17
'Uthmaniyah	33	10	3	0	1	2	0	49
Hawiyah	0	1	1	0	0	0	0	2
Haradh	0	7	1	0	1	0	0	9
Fazran	0	2	1	0	0	2	1	6
Khurais	0	7	0	0	0	2	1	10
Khursaniyah	0	5	2	0	0	1	0	8
Manifa	0	3	0	0	0	0	1	4
Qatif	9	1	1	0	1	1	0	13
Safaniya	20	12	1	0	0	0	0	33
Totals	200	71	19	18	4	24	4	340

[1] Including one gas-cap test well. [2] Including three gas-injection and nine water-injection wells. [3] Including three gas wells. [4] Including two gas wells. [5] All are gas-injection wells.

(GOSP's) and raised from an intake pressure of 125 psi to a discharge pressure of 2,100 psi in five stages. It is then put into five injection wells which are on the crest of two structural closures in the 'Ain Dar area.

This is the newest installation in Aramco's gas-conservation efforts. The first plant, in the Abqaiq field, began operating in 1954. Supporting facilities for the 'Ain Dar plant include a 5,600-kw power plant, 34 miles of gathering lines, 19.6 miles of injection lines, and a 66,000-volt power-transmission line from Abqaiq to 'Ain Dar.

Also in 1959, Aramco approved a miscible-phase injection program to conserve gas and increase recoverable reserves in the north dome of the 'Ain Dar field. Raw liquefied petroleum gas will be pumped from Abqaiq to 'Ain Dar, where it will be mixed with the high-pressure gas stream from the gas-injection plant. Budgeted cost for the project, scheduled for completion in mid-1961, is $8 million. To provide the raw LPG, a compression plant will be constructed at Abqaiq, with a capacity of 37,000 b/d of raw LPG at 515 psi. From the compression plant, the raw LPG will be pumped to 'Ain Dar and there raised to 2,100 psi by 1,500-hp motor-driven pumps before it enters the gas stream. Combining the LPG with the injection gas in correct proportions forms a miscible phase.

The turbine and compressors for the Abqaiq compression plant will be manufactured by Sulzer Bros. Ltd., of Winterthur, Switzerland. Capable of developing 14,500 hp, the 58-ft-long by 25-ft-wide 275-ton gas turbine will drive three centrifugal compressors.

Reserves: Aramco's proved recoverable reserves as of January 1, 1959, were estimated at approximately 36.7 billion barrels, 1.7 billion greater than a year previous and a 4.6% increase. This is an extremely conservative estimate by Aramco.

PRODUCTION: Average crude oil-production by Aramco during 1959 was 1,095,339 bbl per calendar day—higher than the previous peak (on an annual basis) of 1,015,029 b/d during all of 1958.

The new Khursaniyah field is scheduled to go into production during the first half of 1960, bringing to six the number of fields Aramco has in production—including Abqaiq, Dammam, Ghawar, Qatif, and Safaniya. Five wells, No. 1, 3, 5, 7, and 8, have been completed as producers in the new field, located about 105 miles northwest of Dhahran and 60 miles southeast of Safaniya. Khursaniyah crude, sour and of 32 API gravity, will be alternated in the Safaniya-Ras Tanura pipeline with the Safaniya crude, which is sweet and of 27 API gravity. One plan is to provide an average shipment to Ras Tanura of 120,000 b/d—45,000 b/d from Khursaniyah and 75,000 b/d from Safaniya. Cost of the production facilities at Khursaniyah is budgeted at $2.8 million.

Production from Safaniya—the first offshore field in the Persian Gulf—averaged some 68,081 b/d during the first nine months of 1959. However, pumping and handling facilities exist for a capacity of 175,000 b/d. No new wells were drilled there during 1959, and at the beginning of that year 33 wells had been drilled, of which 19 were producing, 13 were shut in, and one was on observation.

As of September 30, 1959, Aramco had 200 producing wells, including 196 oil and three gas wells, and one gas-cap test well. Estimates of increase show the company's production rising to about seven million barrels daily by 1980.

REFINING: During the first 10 months of 1959, the Aramco refinery at Ras Tanura processed an average 172,120 b/d. The highest throughput for any month was an average 201,902 b/d in March.

The new $7 million alkylation unit, the first for the refinery, was completed and started test runs in June 1959.

In July 1959, construction began on a new $5.25 million plant to make sizable quantities of refrigerated LPGas available for offshore sales from the Ras Tanura terminal. The new plant was completed in August of 1959. Capacity is 4,000 b/d, the first in the world to make LPG available for tanker shipment. The new facilities will include two 80,000-bbl steel tanks for storing the LPG at atmospheric pressure, loading pumps, and a 22-in. pipeline to transfer the liquid product to the pier for loading into special refrigerated LPG tankers.

TRANSPORTATION: With the completion of an expansion program in 1958, the total capacity of the Trans-Arabian pipeline system was raised to about 460,000 b/d. These new facilities enabled Tapline to deliver an average of 449,554 b/d of crude oil from Sidon, in Lebanon, during September 1958, a new peak for Tapline for any single month. However, the deliveries during the first 10 months of 1959 averaged 338,327 b/d; the 1958 average was 349,082 b/d.

The Saudi Arabian director general of petroleum, Sheik Abdullah Tariki, has urged the Arab nations to build a giant new pipeline, with assistance of the oil companies, from the Persian Gulf to the Mediterranean. To cost some $600 million, with a capacity in excess of one million barrels daily, the proposed twin 32-in. lines from Iraq through Syria and Lebanon would include the following feeder lines: 18-in. from Basrah in southern Iraq; 26-in. from Kirkuk in northern Iraq; 26-in. from Kuwait; and a 28-in. line from Dammam in Saudi Arabia, to be joined by a 14-in. line from Qatar. Adjustment could be made were Iraq to join the proposed project.

Also for the future is a move toward a German-Saudi Arab operation. A new joint company, set up in Bavaria, Germany, in 1958, said it will explore the technical possibilities of building a pipeline to transport Saudi crude from the Mediterranean to a proposed refinery at Bavaria. The company, Deutsche Arabian Oil Co., was established in Munich by Hassan Yusseff Yassin, younger son of Saudi Arabia's deputy foreign minister, and by an American, Morton P. MacLeod.

An addition to Ras Tanura, shipping facilities were completed by Aramco in mid-1959. An 800-ft $3.8 million extension brought the North Pier total length to 2,160 ft, increasing tanker berthing to 10 from eight. A new design of open pipeway was incorporated in the extension. With a 30-ft roadway on each side, the center of the pier is open, permitting placement of the piping higher above the water and sunshine around the lines—thus keeping them dry and reducing possibilities of corrosion.

MARKETING: Local consumption within the country (excluding Aramco) averaged 8,775 b/d for all products during 1958, up some 5.5% over the previous year.

Aramco put its natural gas on the market during 1958, its objective "to attract to Saudi Arabia industries to utilize the low-cost bulk energy available in the form of natural gas." The company has offered to cooperate with any prospective gas purchaser and to assist in choosing a plant site, taking into consideration location of gas reserves, port facilities, labor supply, water availability, and transportation. Gases are being made available from the 'Ain Dar, Shedgum, and 'Uthmaniyah areas of the Ghawar field, and from the Safaniya, Khursaniyah, and Abqaiq fields. Total supply available in 1959 has been estimated at 163 million standard cubic feet per day, which is expected to rise to 201 million in 1960 and to 214 million in 1961. Additional volumes would become available as new fields were developed or present fields expanded. Gases for sale are unprocessed, containing in most cases from 1% to 6% hydrogen sulfide, and with heat contents ranging from 900 to 2,600 Btu/scf.

OIL LAWS

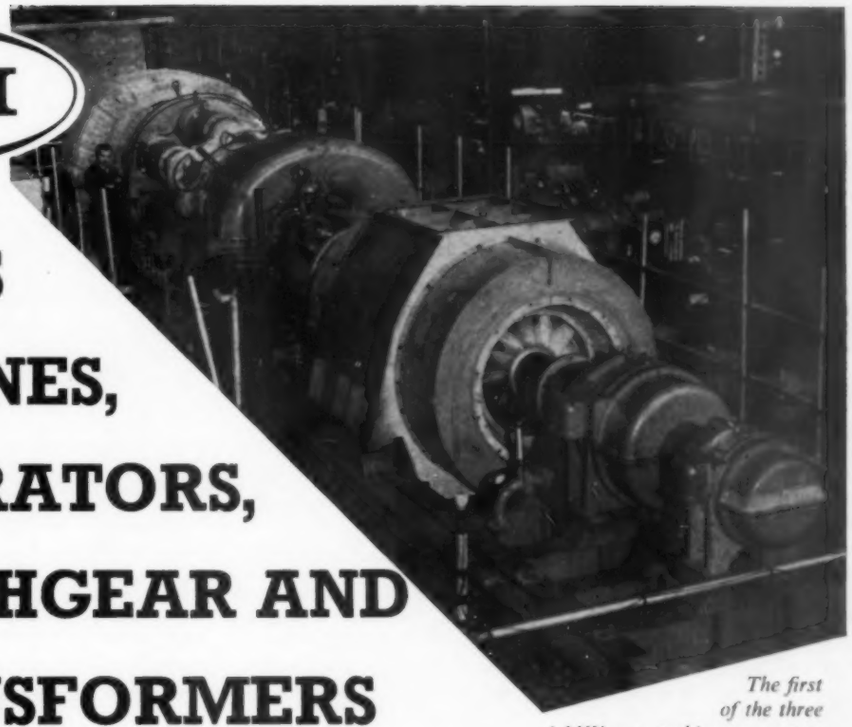
During 1959 the concession contract of Aramco, with amending letters and agreements, was published in an outstanding new publication entitled *"Middle East—Basic Oil Laws and Concession Contracts."* The texts of other agreements in the Middle East are contained as well, most of them published for the first time. Information on the publication may be obtained from *Petroleum Legislation Ltd. P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be sent directly to that address.

There is no oil law in Saudi Arabia as yet, although one is being formulated with the aid of an advisor, Frank Hendryx, legal counsel to the government and formerly counsel for Esso in Latin America. Oil-producing operations within most of the country are presently governed by the terms of the Aramco concession, as summarized in *World Petroleum Report 1957*, p. 233 and 236.

Terms of the new oil law have not as yet been revealed. Based on press reports, it will require: (1) a 60-40 "integrated" profits split—which means the company must establish an integrated operation from exploration through marketing and pay the tax on the net income from all operations; (2) a refinery consrtuction obligation equal to a minimum of 30% of production; (3) the company must help start a petrochemical industry in the country; (4) it must be an Arab company, incorporated or at least domiciled in Saudi Arabia.

The government had made it clear that the tax referred to above would not be retroactive. Therefore, existing concessionaires are not affected, though they will be under pressure for revision. Aramco was the target of sharp challenges during the Arab States Petroleum Congress in Cairo in the fall of 1959. Mr. Hendryx at that time upheld the right of a sovereign nation to cancel or alter any oil concession agreement. He declared, however, that his stand did not mean Saudi Arabia planned immediate changes in its pact with Aramco. Aramco has also come in for criticism in the local press; *al-Bilad*, a Mecca daily, said the company had not evaluated its concession area properly.

AEI



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In New York, the State Supreme Court ruled that Aramco does not have the right to question its prospective employees on their religion. The company had claimed exemption from non-discrimination rulings in New York because Jews are not to be allowed to work in Saudi Arabia.

NATIONAL FACTORS

Shaikh Hafiz Wahba, the Saudi Arab ambassador-at-large to the Arab world, and Shaikh Abdallah H. Tariki, director general of petroleum and mineral affairs, were both elected to the board of directors of Arabian American Oil Co. in June 1959. This was in keeping with an agreement between the government and Aramco that the government should have representation on the board.

Shaikh Tariki has stated in interviews that Aramco will be pressed to expand its refinery operations. He also stressed the need for Arab-Venezuelan unity.

SYRIA

EXPLORATION: The only private company exploring is Concordia, owned by Deutsche Erdoel, a German firm. The company has been using three rigs, drilled eight wells, and had oil shows in all of them. During late 1959 Concordia reported a discovery at Suwaidiyah, northeast Syria. Drilling was under way at the year's end at Tchembe and Toneman: wells No. 7 and 8, respectively (see map). Concordia's concession expires September 6, 1960, but the company has a right to a four-year renewal provided exploration plans meet with government approval. An exploitation concession is being negotiated.

The government, having taken over the Karatchok (sometimes spelled Karachuk) field, announced in February 1959 that a Soviet team with four heavy rigs was arriving. In August, another announcement was made of a productive seven-mile stepout from Karatchok by the Soviets.

Reserves: The government has estimated reserves at the Karatchok field at 150 million tons, of which about 40 to 50 million were recoverable (about 280 to 350 million barrels).

PRODUCTION: There is no production as yet of crude in Syria, but the government has announced plans for development of the Karatchok field (see *WPR 1959*). A government committee announced, on January 15, 1959, that production would be about 2,000,000 tons per year (about 40,000 b/d) for 25 years, after pipeline facilities had been installed.

TRANSPORTATION: Syria is crossed by two of the world's great pipelines, owned by Tapline and by IPC. During 1959, the government announced bids would be invited on a 6-in. 340-mile products line from the new Homs refinery to storage tanks in Damascus, Aleppo, and Latakia. A 12-in. crude line from the Karatchok field to Tarsus port on the Mediterranean, 450 miles, is planned.

Negotiations with Tapline concerning a settlement of the transit fees controversy are continuing. No settlement has been announced. IPC has reached its settlement (see *WPR 1959*).

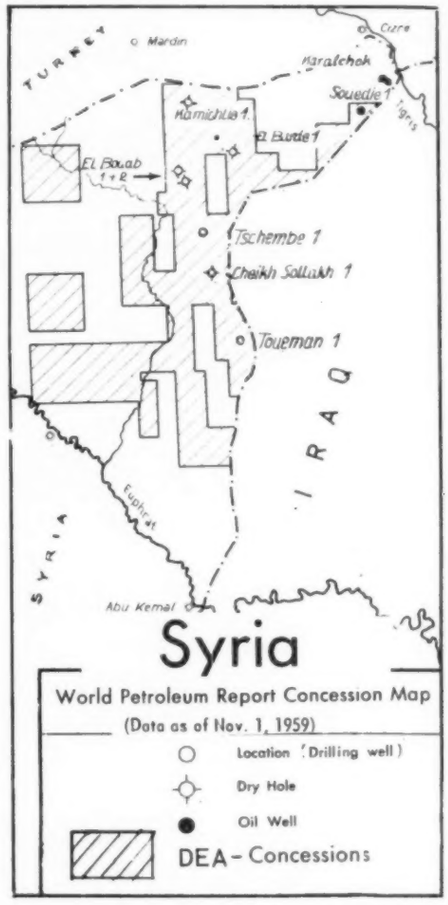
Refining: According to press reports, the 20,000 b/d refinery at Homs, Syria, constructed by a Czechoslovak firm, was completed in June. The Homs refinery will supply local requirements until about 1964. The government has proposed a new refinery at al-Qamishli in the extreme north of the Syrian region near the Karatchok field. This refinery would have an annual capacity of 200,000 tons (about 2,000 b/d).

Syria reportedly also has accepted a bid by the Czechoslovak State enterprise "Technoexport" for construction of an LPGas plant with a capacity of 35,400 bottles per month, scheduled for completion in 1960.

OIL LAWS

During 1959, there appeared an unusually complete collection of Middle East documents, known as *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* It contains the basic concessions for the Middle East in word-for-word English translation, including the *Concordia* concession in Syria of Deutsche Erdoel. Copies of the publication are available from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* All inquiries should be sent to that address.

During 1959, Decree 98 of May 16, 1959 (promulgated May 3, 1959, in Cairo) applied Law No. 66 of Egypt to the Syrian region of the United Arab Republic. The oil law of Egypt, therefore, becomes applicable to Syria. For a résumé of that law, see the Egyptian section herein.



TURKEY

EXPLORATION: No commercial discoveries have been made as yet, but the companies continue intensive exploratory activity despite nearly 20 dry holes. At the beginning of 1959, 108,000 square kilometers were under license. More will have to be examined before prospects are fully assessed. Two geologists of the Institute of Mineral Research and Exploration estimate* there are in Turkey over 121,000 square kilometers of sedimentary areas highly favorable to oil discovery, including the present producing areas, and a further 165,000 square kilometers of favorable sedimentary conditions (also containing seepages) and 389,000 square kilometers of less promising areas. Western Asiatic Turkey and much of the north and central areas are unfavorable for oil discovery.

The only discovery so far has been at Kahta, in the Gaziantep area, where American Overseas Petroleum (Texas and California Standard) found 11 deg API gravity oil in small quantities at 3,640 ft. Further drilling is being carried out, but it has not as yet been established that commercial quantities are present. The company abandoned No. 4 Kahta, located about 1¼ miles east of No. 2, at 4,090 ft. The sixth test, No. 1 Sahabe, two miles southwest of No. 3 Kahta, currently is being drilled.

Esso Standard (Turkey) Inc. has spudded Dudere 1 near the Kahta well. The company's fifth wildcat, No. 1 Kastel, was abandoned dry in District V. The company abandoned its first

*Messrs. Cahit Erentoz and Zati Ternek in a paper, "Oil Possibilities in the Sedimentary Basins of Turkey," presented to the Fifth World Petroleum Congress, in 1959.

TURKEY—Tidewater's Exploratory Wells Southeast
(August 20, 1959)

Well	Location	Spudded	Abandoned	Depth (Feet)	Results
Bakuk #1	15 miles NE of Nusaybin	12/3/57	9/30/58	12,506	Small gas show
Ebyat #1	43 miles NE of Nusaybin	12/3/58	5/7/59	11,684	No significant shows
Dirpu #1	20 miles NE of Nusaybin	6/5/59	7/24/59	4,588	No significant shows

Currently moving to location in Urfa area, District VI

test in District V, No. 1 Gercus, at 6,766 ft. Three wildcats in Thrace were abandoned at depths ranging from 4,342 ft to 10,839 ft. Noncommercial oil was found in No. 1 Osmancik.

Mobil Exploration Mediterranean Inc. went below 7,000 ft in its first dry wildcat, No. 1 Kuransa, in District VII. The Socony subsidiary is not drilling now.

Tidewater Oil Co. has spudded its third wildcat (see accompanying table).

Royal Dutch/Shell has abandoned its second wildcat in Thrace, and will move its rig into District VI to spud its third test. The company carried No. 1 Kendamis to 12,040 ft. No. 1 Terzili, near the town of Babaeski, was also abandoned below 12,000 ft.

Bolsa Chica Oil Corp. suspended drilling after 4 dry holes and pulled out. Turkish-American Oil Co., operator for Gilliland Oil Corp., drilled two dry holes in District V near the Turkey-Iraq-Syria border. No. 1 Rubai, located about 17 miles southeast of Cizre, was abandoned at 7,665 ft, with junk in the hole, in June 1958. The rig was skidded 50 ft, and No. 2 was spudded—eventually abandoned at 10,200 ft.

Pan American Land & Oil Royalty, of Dallas, Texas, has one geological survey under way. Marmara Petroleum Corp., a Husky Oil Co. affiliate, has done some gravity and seismic work. Two German independents—Deilmann Montan and Deutsche Erdoel—have done seismic work in Districts I and V, respectively.

Turkish Gulf Oil Co. drilling its first exploration well in Turkey. The well, Murefte #1, is on the outskirts of the village of the same name, in Thrace, some 168 miles west of Istanbul on the shores of the Sea of Marmara.

Exploration by Turkiye Petrolleri Anonim Ortakligi (TPAO): The government has been active during 1959 through TPAO. The company drilled three dry wildcats, Kentalan-7, Garzan-37 and Resan-3, and another wildcat Sadak-1 is being drilled. All wells are in Petroleum Districts V. Kentalan-7 was a basement test, spudded January 24, 1958 and abandoned dry January 6, 1959, total depth 2208.3 meters. Garzan-37 was a fault test in Garzan field, spudded January 1, 1959. After penetrating the Cretaceous reef pay, the well is temporarily suspended due to casing failure while testing the open hole portion of the hole from 2,485.8 to 2,516.2 meters.

Resan-3 was spudded December 12, 1956 as a Cretaceous test. The well was abandoned as a dry hole on August 29, 1959 at 1,903.9 meters.

Sadak-1 was spudded in Gercus shale on October 16, 1959. Cretaceous reef limestone, payzone in both Raman and Garzan fields, is the objective. Latest available depth is 1,377 meters. Projected depth has not been reached.

Garzan Field-1 well was spudded in 1958 and completed during 1959, at total depth of 1,685.8 meters. Another nine wells were drilled and completed during 1959 for a total of 15,607.5 meters. Two wells are drilling, Garzan-45 and Garzan-46. In Raman field two wells were drilled and completed during 1959 for a total of 2,632.4 meters. Another well, Raman-36 is being drilled. In Germik field, two wells, Germik 2 and Germik 3, are being drilled. Proposed depths are 2,000 meters each.

By the end of 1959 a total of 31,365.0 meters will have been drilled, including all wildcats and development wells.

PRODUCTION: All production is by the government's Turkish Petroleum Corp., which produced about 7,266 b/d during 1959 from the Raman and Garzan fields. A new field, Germik, is not believed to be on production as yet.

Reserves: Reserves in the Garzan field are estimated by the government at about 52.5 million barrels. Reserve figures for the other two fields are not available.

REFINING: There is one refinery, a 6,600 b/d plant at Batman, owned by the government. A 15,000 b/d refinery is planned by Turkish American, an independent company, at Istanbul.

Contract for a 65,000 b/d refinery at Mersin, with the Foster Wheeler Corp., has been announced by Mobil International Oil Co., acting as agent for Anadolu M. Tasfiyehanesi AS (ATAS), a Turkish company which will operate the refinery. ATAS is jointly owned by British Petroleum Co. Ltd., California Texas Oil Corp., Mobil International, and the Shell Petroleum Co. Ltd.

The $50 million refinery is scheduled to go on stream in late 1961. Initial installations will include crude distillation, catalytic reforming, and kerosine desulfurization units—designed to process Middle East crude and produce automotive gasoline, kerosine, diesel fuel, and heavy fuel oil required by the Turkish market. In addition to the processing units, the refinery will have two berths capable of handling simultaneously two tankers of up to 50,000 tons each.

Caltex has reached a separate agreement whereby jointly with the government it will build a 20,800 b/d refinery near Istanbul on the Gulf of Izmit. Caltex will finance the $25 million plant, holding an initial 49% interest. It will operate the plant for 10 years from its on-stream date in January 1962, then sell its share to the government at nominal value. All crude will be supplied by Caltex at competitive prices, and Caltex will distribute within Turkey.

MARKETING: Oil demand has been restricted by the check upon imports of vehicles and by the general stagnation of industry and transport in recent years. Devaluation has raised local oil prices and brought another obstacle to expansion of use. Prices of all products are fixed by the government, and all products bear tax. The main marketing companies are Mobil, Shell, and BP; but the Turkish government has also its own company, Petrol Ofis, which supplies the armed forces and also distributes generally in the country (in competition with the oil companies) and now supplies about one-third of the market. There is also a small privately owned local company, Turk Petroli, which is linked with Mobil.

OIL LAWS

During 1959 Turkey's oil law and regulations, with all recent amendments, were published in an unusual and very useful compilation entitled *"Middle East—Basic Oil Laws and Concession Contracts (Original Texts)."* It is available from the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be directed to that address. It also contains the principal concession documents for the Middle East, such as the ARAMCO concession, the Tapline concession, etc.

No changes took place in Turkey's oil laws during 1959. For a summary of them, see *World Petroleum Report 1958*. For a citation of such laws, see *World Petroleum Report 1959*.

NATIONAL FACTORS

The principal considerations affecting investment are discussed in detail in *World Petroleum Report 1957*, p. 254. Briefly, they include: (1) no exchange control for oil earnings; (2) peaceful labor situation; (3) low income taxation, consisting of a 10% corporation tax, plus a 15% withholding tax on the remaining 90% of profits, for a total of 13.5% tax; (4) no change in the government's liberal attitude toward international investment.

Commercial debts (including $40 million for oil outstanding in August 1958) were dealt with in May of 1959 in a multilateral agreement made in Paris between Turkey and 13 OEEC countries. It consolidated these debts totaling the equivalent of $470 million, and provided for payment by agreed installments over 12 years plus 3% interest. The installments may be advanced if they are accepted in Turkish currency for local investment. The four oil importing companies, Mobil, Caltex, Royal Dutch/Shell, and BP, have an agreement with the government. The oil companies are in a special position in view of the investment they are making in a new local refinery, and some of the $40 million owing to the companies for past supplies will be made available for this investment over the next three years in Turkish liras. Funds released will be used only for the local expenditure in constructing the new refinery and for the local expenditure element of investment in marketing facilities and in exploration; these funds may not be converted in any way into foreign exchange. All imported material and services will call for capital expenditure abroad by the oil companies. The latter avoid loss from devaluation of the lira by this agreement, and can proceed with the construction of the refinery.

MUSCAT AND OMAN

EXPLORATION: There are two important exploratory operations: one by Cities Service in the Dhofar province of Muscat and Oman; and the other by Petroleum Development (Oman) Ltd., a subsidiary of IPC, which is exploring the rest of the country. Previous activity by these companies is covered in *World Petroleum Report 1957, 1958, and 1959*. Neither has made a commercial discovery yet.

In Dhofar, Cities Service has produced oil only from Marmul No. 2 well. The productive rate was very low and uncommercial. The oil was also of very low gravity. The latest well was a stratigraphic test, called Ahboot. Two wells GM 1 and MIO 1, drilled during early 1959, reported heavy oil shows on the way down, but were not considered significant.

The company has made a considerable exploratory effort, and is continuing it now with three rigs—one light—and two-heavy duty. Recently completed on separate structures was Kharail No. 1 northwest of Marmul No. 1.

IPC is continuing its search in the rest of Muscat and Oman, using one heavy rig. It drilled Ghaba No. 1 to 12,661 ft in March 1959, and abandoned the well at that depth. Toward the end of May, Haima No. 1 was spudded approximately 120 miles southwest from Ghaba.

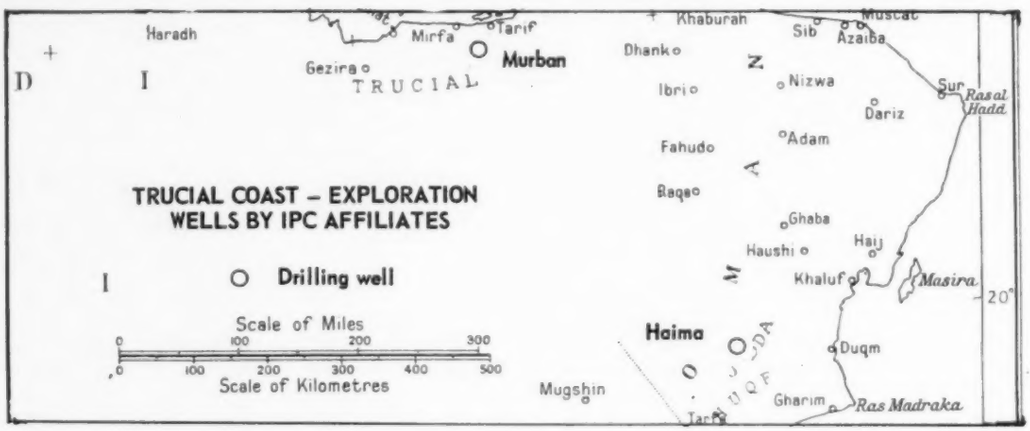
OIL LAWS

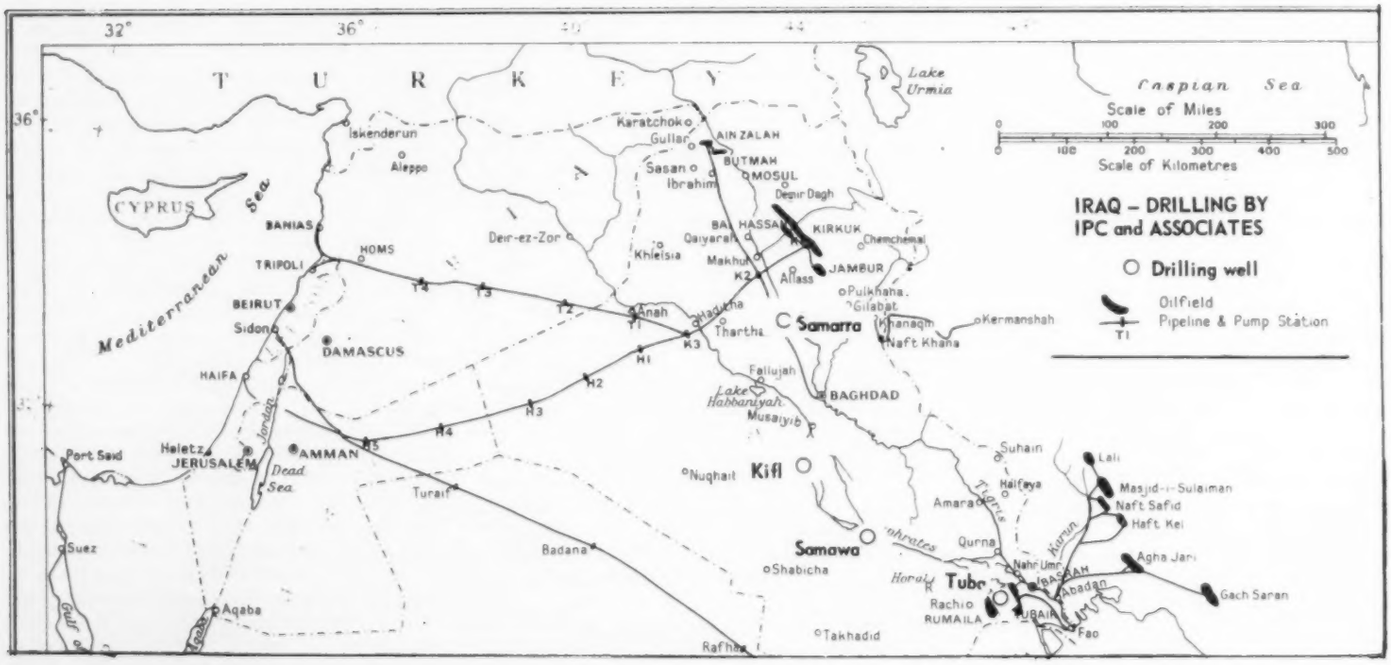
The concessions in Muscat and Oman have never been published nor released. For a brief summary of the Dhofar concession, which is based on authorative sources and is the only published resume available, see WPR 1958. The IPC concessions over the rest of Muscat & Oman are reportedly of very simple exploration agreements, with provision for negotiation of more detailed concessionary arrangements if rights are granted.

TRUCIAL COAST

Little drilling has been done in this region, which is under concession to IPC and its affiliates. There are seven principal sheikdoms in the Trucial Coast: Abu Dhabi, Dubai, Sharjah and Kalba, Ajman, Umm al Qaiwain, Ras al Khaimah, and Fujairah. IPC will not renew its Fujairah concession which expired in August, according to reports.

For a resume of drilling along the Trucial coast by IPC, see WPR-1959, page 5. The Ghaba well shown there has since been completed at 12,661 ft and abandoned. The rig is now drilling at Haima to the southeast. Drilling has been very unsuccessful with the exception of Murban. Partly this is due to lack of porosity. Moving away from the mountains may help this, and that is one reason for the company's moving its rig progressively away.





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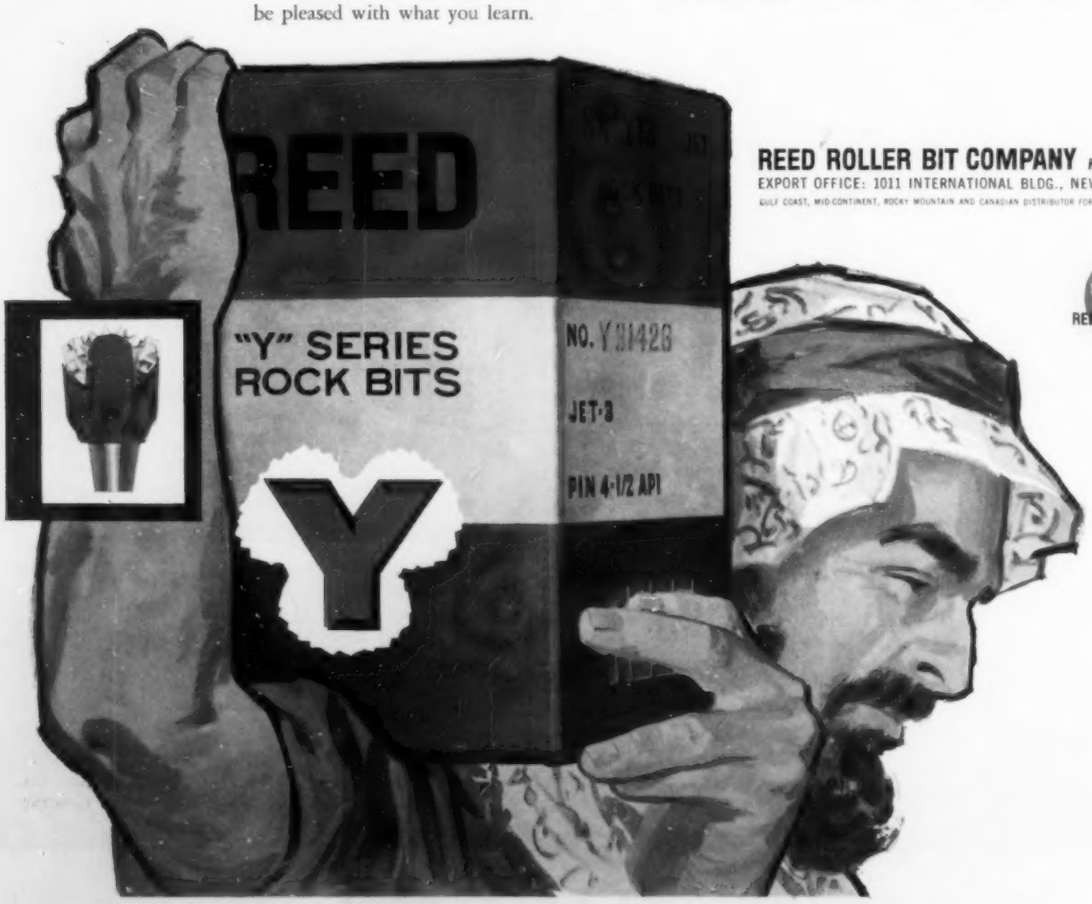

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SOUTH AMERICA

EXPLORATION: The success of the Argentine contracts continued to dominate the South American scene. Elsewhere, Exploration was disappointing. The Pure Oil Co., has halted operations in Paraguay and Bolivia, and Venezuelan activities are held down by the government's attitude which has become increasingly restrictive. In no other country in the area was a lucrative find made.

PRODUCTION: During 1959 production rose slightly compared with 1958. The production of Argentina continued to rise sharply. That of Brazil and Chile also is rising, although the limits of the increase are approaching fast.

REFINING: Refining capacity in 1959 was up also, compared with 1958. Large refinery expansion programs are under way in Argentina and Brazil.

MARKETING: Demand rose in 1959, compared with 1958. The excess of production over consumption has enabled the continent of South America to remain one of the world's largest exporters of crude.

OIL LAWS

One of the more significant events of 1959 was the publication of all South America's oil laws in a single volume which is kept current. This marks the first time such laws and regulations have been available in word-for-word translation, and they include many concession contracts of use to oil companies and students in the area. They are contained in a publication entitled *"South America—Basic Oil Laws and Concession Contracts (Original Texts)."* The publisher is *Petroleum Legislation Ltd.*, and the publication may be obtained by writing to *P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

There were no major oil law developments during 1959. The contracts in Argentina continued to hold the center of the stage. Venezuela's efforts to begin a national oil company were just getting off the ground at the end of 1959 and had not yet had any impact on the companies operating there. Important legal changes are pending in Paraguay, but the likelihood of changes in Brazil, Chile, Bolivia, and Colombia lessened.

NATIONAL FACTORS

The climate for private investment in oil improved in most countries of the area, with the important exception of Venezuela. No siginificant tax increases occurred.

ARGENTINA

EXPLORATION: Oil activity has been at a higher peak in Argentina than in any other South American country during 1959. The contracts which were let in 1958 have begun to show results in oil production and the government's YPF let several drilling contracts of its own during 1959 which further stimulated activity.

Of the recent contracts, only those of Shell and Union were for areas of a purely exploratory nature, and Union Oil Co. of California has already brought in its first producer, having reported during December 1959 that Las Alazanes No. 1 well, spudded on September 5, was a producer at the rate of 565 b/d from 4,038 ft. It is located directly north of Pan American's Comodoro Rivadavia acreage.

During 1959 the government announced, through YPF's office in New York, that bids would be accepted until August 4, 1959, on exploration and exploitation contracts in the northern provinces of Santa Fe, Cordoba, etc. (see map).

Only two companies, Continental Oil and Ohio Oil, bid on the new Argentine acreage, plus one company which bid on a small drilling job with two rigs. The Continental and Ohio offers were identical. They contained a $16 million investment offer in an initial 10-year period. Investment would be $2.5 million in the first three years, $5.5 million in the second three, when the acreage would be reduced 50%. The lack of cash bonus offers was a blow to YPF, which already has direct financial obligations of over $1 billion payable. At the end of 1959 the contracts had not been finally approved.

A number of new drilling contracts were signed in 1959. They included new agreements with ENI (the Italian government company), Southeastern Drilling Co., Kerr-McGee Oil Industries Inc., Tennessee Gas, and others. YPF also signed with the Argentine firm of Technicaqua SA for termination and reactivation of YPF wells in Mendoza, San Juan, and Neuquen. The contract, which is on fee basis, is for $1,200,000.

A contract negotiated by Tennessee Gas Transmission Co. with YPF for drilling in Tierra del Fuego, the extreme southern part of Argentina, covers the areas which were included under the 1957 contract with Laughlin Porter Drilling Co., of Houston, Texas, and is described as a "renewal," rather than a new contract. It has a 25-year life, covers 5,404 square miles, and calls for a $10 million expenditure in the first three years, including $4 million for exploration. Oil discovered will be sold to YPF for $1.77 per barrel ($11.15 per cubic meter), adjustable later to world market prices. YPF reserves all marketing rights.

The Carl M. Loeb, Rhoades affiliate, LR Development Ltd., is producing and delivering to YPF about 10,700 b/d. The company completed 50 to 60 wells in the Mendoza area by the end of 1959.

Pan American International Oil Co. had drilled over 60 wells on its contract area in southern Argentina by the fall of 1959, and had produced more than 180,000 bbl of oil. The company, which was the first to sign an oil development contract with Yacimientos Petroliferos Fiscales, the Argentine State oil agency, presently has 14 rigs operating, 10 drilling and four on completion work. The rigs have drilled, or are in the process of drilling, 46 wells in Cerro Dragon, six in Canadon Grande, and 11 in Anticlinal Grande—for a total of 63 wells since drilling commenced January 6, 1959.

In addition to the development program, Pan Am International is drilling a deep wildcat at Anticlinal Grande, which is projected to basement, expected to be around 8,500 ft. Deep wildcats were also drilled to basement in Cerro Dragon and Canadon Grande in 1959.

Wells in Cerro Dragon reach a depth of between 4,250 ft and 6,600 ft, and take from 9 to 15 days to drill. At Anticlinal Grande, wells are drilled to about 3,300 ft, and require about 12 days. Pan Am International's present producing

capacity from wells completed to date is about 10,000 b/d.

The company is building a new pipeline from Anticlinal Grande through Cerro Dragon to Caleta Cordova. Construction was to begin about November 1, 1959, with completion scheduled for about February of 1960. It will have an initial capacity of about 50,000 b/d, with provision for increasing capacity by the addition of pumping stations. By the time the new pipe-

line is completed, Pan Am International expects to have producing capacity of over 12,500 b/d which will be transported through the line. Producing capacity is expected to increase to about 35,000 b/d by the end of 1960. Pan American plans at least 100 production wells during 1960. It estimates it can drill the 100 wells in eight months, and then turn to exploratory drilling.

YPF Development Plans: The government's oil agency has extensive plans for development, if it can overcome its obstacles of financing and organization. YPF officials have stated that the important increases in production are to come from Salta, the various areas of the private companies, and especially from the south flank of Comodoro Rivadavia, which is to be producing over 60% of the national total in 1964. The following steps are given by YPF as indispensable for success of the six-year plan: (1) Completion of the gas and oil pipelines from Campo Duran to Buenos Aires and San Lorenzo in 1960. (2) Construction of a new gas pipeline from Comodoro Rivadavia to Buenos Aires, or liquefication and ocean transport of the gas, one of which should be put into operation in 1962. (3) Provision of ocean transport for Comodoro Rivadavia oil, either by obtaining more tankers for YPF or by contracting tankers. (4) Provision of railway tank cars, and later a pipeline, for transport of Mendoza oil and arrangement of transport facilities from the north flank of Comodoro Rivadavia to the sea. (5) Drilling of the 4,557 wells projected for the south flank of Comodoro Rivadavia.

The cost of this effort will be very high indeed. Dr. Soifer has estimated the drilling costs alone will reach $750 million. The costs of the remaining effort needed make the estimated total over $1 billion.

Reserves: Reserves proved at year-end 1959 were estimated at 3.7 billion barrels.

PRODUCTION: Crude oil production is rising rapidly under the impetus of the new contracts let. In 1959 it rose to an average of about 120,000 b/d for the year, compared with 97,948 b/d in 1958. During the first half of 1959 oil production reached maximum carrying capacity of existing transport facilities. Projects to increase transport capacity for oil have been under way, but will not show results until early 1960.

According to Dr. Marcos Soifer, head of YPF's exploitation department, Argentina will reach near self-sufficiency in petroleum with a production of 15.6 million cubic meters of crude (269,250 b/d) in 1961, or 18.9 million cubic meters of crude and gas-equivalent of crude. Crude production alone is to rise to about 30.1 million meters (519,534 b/d) by the end of 1964. These goals appear nearly impossible of achievement, however, especially the four-fold increase by 1964.

Bolivia started shipping 2,520 b/d of crude to Argentina in 1959 as payment for Argentine construction of the Yacuiba railroad. The shipments mark the inauguration of the first 360-mile stretch of the Argentine oil monopoly's Campo Duran pipeline, which will eventually run 923 miles to YPF's San Lorenzo refinery.

REFINING: The government plans a new 35,000 b/d refinery near Bahia Blanca port, at the end of the 15-in. pipeline from Neuquen now being built and financed by Esso.

Royal Dutch/Shell said it will invest a further $22,400,000 in expansion of its Argentine refineries.

Nearly $25 million will be spent on new facilities to make basic materials for plastics and synthetic-rubber requirements. Industrias Plasticas Argentinas Koppers SA (IPAK) will build the plants near Buenos Aires. New facilities will include an ethylene plant, a polyethylene plant, and a styrene monomer plant. They are expected to be onstream by 1961.

Texas Butadiene and Chemical Corp. will build a $40 million petrochemical and synthetic-rubber complex, including three plants at the deep-water Atlantic seaport of Comodoro Rivadavia, about 1,000 miles south of Buenos Aires in Patagonia. The plants, when completed in 1962, will have a capacity of 30,000 tons per year of butadiene and 40,000 tons of snythetic-rubber. A carbon-black plant will be built in addition to the butadiene and synthetic-rubber plants. It is contemplated that eventually other petrochemicals will be produced. The complex will be privately financed by Texas Butadiene; the government will have no ownership rights.

YPF plans a boost of almost 100,000 b/d in its 168,000 b/d refining capacity by 1961. A new 31,500 b/d cracking unit at Campo Duran and expansion of some existing units are now underway.

TRANSPORTATION: The State Gas Agency in Argentina plans to spend the equivalent of $458,000,000 through 1964 to expand gas lines, distribution facilities and related equipment, according to Esteban Perez, head of the agency. The first stage is to be completed Oct. 31, 1960, with investment of $13,750,000. The five year plan foresees development of a gas pipe line system to transport 23 million cubic meters of gas daily from producing fields to consuming centers. Pipe lines figuring in the plans are the existing line from Comodoro Rivadavia to Buenos Aires, the line under construction between Campo Duran and Buenos Aires, a projected line from Comodoro Rivadavia to Buenos Aires, and other projected line between Campo Duran and San Lorenzo via Resistencia.

A crude-oil pipeline has been placed in service by YPF between Guemes, Salta province, and Tucuman; this will allow pumping of crude from Campo Duran to Tucuman. The line is 12¾ in. in diameter. It is part of a line being constructed on to San Lorenzo, Santa Fe province, and due for completion early in 1960. The oil will be carried by rail from Tucuman to San Lorenzo, where YPF has a refinery.

OIL LAWS

The oil law of Argentina; the contracts with Esso, Pan American, Union, Shell, and Carl M. Loeb, Rhoades & Co., as well as all the new drilling and service contracts, have been published in an English translation entitled *"South America—Basic Oil Laws and Concession Contracts."* It is available from the publisher, *Petroleum Legislation Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

The new contracts—first signed with Pan American and later signed with Esso, Shell, Union, and Carl M. Loeb, Rhoades Co.—are self-financing development contracts. The later drilling contracts with Tennessee, ENI, Kerr-McGee, others call for payment by YPF for wells

ARGENTINA—Projected Production and Consumption, 1959-64[1]
(Millions of Cubic Meters)

Year	PRODUCTION Crude Oil	Gas-Equivalent of Crude Oil	Total	Consumption	Deficit or Surplus
1959	7.5	0.8	8.3	17.0	—8.7
1960	11.2	2.0	13.2	18.0	—4.8
1961	15.6	3.3	18.9	19.0	—0.1
1962	18.7	4.6	23.3	20.5	2.8
1963	20.4	7.9	28.3	22.0	6.3
1964	21.7	8.4	30.1	24.0	6.1
Total	95.1	27.0	122.1	120.5	1.6

[1]Estimate by YPF.

ARGENTINA—YPF Six-Year Drilling Plan
Number of Wells to be Drilled

Year	By YPF	By Various[1] Private Companies	By Contract[2] South Plank	Total
1959	548	215	78	841
1960	676	254	593	1,523
1961	721	223	922	1,866
1962	721	220	988	1,929
1963	721	220	988	1,929
1964	721	220	988	1,929
Total	4,108	1,352	4,557	10,017

[1]Includes wells to be drilled by all private companies operating in Argentina under both development contracts and service contracts, with exception of south-flank contractors. All estimates by YPF.
[2]Wells to be drilled in south-flank of Comodoro Rivadavia area by drilling companies under service contracts only. To date three companies have been contracted to drill a total of 1,800 wells.

ARGENTINA—Projected Crude-Oil Production, 1959-64
(Millions of Cubic Meters Per Year)

Year	By YPF General	By YPF[1] South Flank[2]	By Private[1] Companies	Total[1]
1959	6.1	0.3	0.4	6.8
1960	7.5	1.3	1.5	10.3
1961	9.1	3.8	1.9	14.8
1962	9.4	6.5	2.0	17.9
1963	9.6	8.0	2.2	19.8
1964	9.6	9.2	2.5	21.3
Total	51.3	29.1	10.5	90.9

[1]Approximate, since figures have been taken from a graph.
[2]This includes only the production from new wells which will be drilled by private companies under service contracts.

ARGENTINA—Imports of Crude Oil and Products, 1950-1958

Year	Quantity (Millions of Cubic Meters)	Cost (Millions of Dollars)
1950	5.9	128
1951	6.3	154
1952	6.9	204
1953	6.8	153
1954	7.0	151
1955	8.1	160
1956	9.1	189
1957	10.0	294
1958	10.2	196
Total	70.3	1,629

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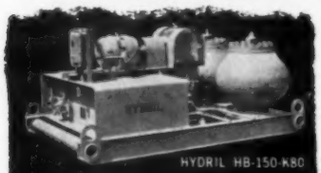

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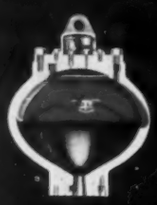

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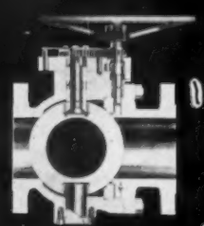

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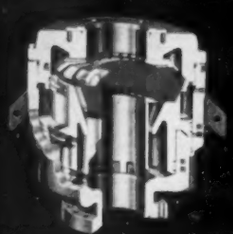

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drilled. For the development contracts, see *WPR 1959*, p. 141, where detailed summaries are given. Also see that issue for the new petroleum law of 1958. For a more detailed review of the old Argentine oil law, see *WPR-1957*.

TENNESSEE GAS CONTRACT

Tennessee Gas Transmission Co. signed a 25-year pact covering exploration and development in an initial 3,456,000 acres. This covers almost all of the Argentine territory of Tierra del Fuego, except for a barren strip south of Lake Fagnano. The contract requires TGT to bring in one drilling rig as soon as possible. By July 1960, the company must have a minimum of four rigs in operation. Laughlin Porter Drilling Co. will do the drilling under a new contract it will sign with TGT. TGT is assuming responsibility for completion of a 12-mile pipeline now under construction to San Sebastian Bay by Ecofisa, and for storage and terminal facilities, including submarine tanker-loading lines which are to be built by Ecofisa. TGT will be reimbursed for the costs by YPF in eight quarterly installments following completion of each project. TGT will operate the pipeline for YPF, and YPF itself will operate the terminal facilities at the bay. TGT's payment, in dollars or pesos, will be $11.15 per cubic meter (about $1.77 per bbl) after it has delivered an initial 504,000 bbl to YPF free, in return for use of existing facilities and equipment. The price will be adjustable to world market prices. The company is committeed to a minimum investment of $10 million for the first three years. It may then withdraw entirely, or else select 11,520 acres for development, while investing another $3 million in exploration on the rest of the acreage in the second three years. If TGT has invested less than $20 million by the end of the sixth year, the acreage will be reduced to the development areas, which then may be doubled to 23,000 acres. If its investment has been $20 million or over, TGT's original 3,456,000 acres will be reduced 20% at the end of the sixth year, and another 20% at the end of the tenth.

YPF is expected to pay $18,750,000, or about $37,500 per well, to Kerr-McGee Oil Industries Inc. under a contract for the drilling of 500 oil wells. This is estimated from the contract price of $10.80 per linear meter drilled and the cost per hour of work on well termination services; 60% of the payments are to be in USA dollars and the rest in Argentine pesos. YPF also is to furnish tubing for the wells, a supply of water for the drilling operations, and will pay the taxes levied on the company. Depth of the wells is estimated at 1,400 to 1,800 meters. The company will use a minimum of six drilling rigs in its operations, which will be in the south flank of the Comodoro Rivadavia area. Kerr-McGee is to drill 75 wells in the first year of the contract, 200 in the second year, and 225 wells in the third year. Kerr-McGee is to turn over the wells on completion to YPF. Kerr-McGee pays a penalty for failure to complete the wells as scheduled.

ENI CONTRACT

YPF has a contract with Societa Azionaria Italiana Perforazioni e Montaggi to drill 300 oil wells in the south flank of the Comodoro Rivadavia area. SAIPEM is a subsidiary of the Italian State oil agency, Ente Nazionali Idrocarburi. Terms call for SAIPEM to drill 45 wells the first year, up to 165 the second, and the rest by the end of the third year. Wells are expected to be 1,400 to 1,800 meters deep. SAIPEM is to be paid the equivalent of $20.50 per linear meter drilled and $50 per hour of work on well terminations. YPF is to furnish casing, tubing, pumps, valves, and other equipment; and payments are to be for services only. YPF also will pay taxes on company operations with the exception of payroll taxes and social welfare levies. Company must set up a bank guaranty of $130,000 until it has begun work, and must operate at least five drilling rigs at the same time. 62% of the payments will be in Italian lire, and the company will finance these payments for four years at 8% interest; 25% will be in Argentine pesos, convertible to dollars at the rate of 65 pesos to the dollar. The remaining 13% will be in Argentine pesos, convertible to dollars in the free-exchange market.

NATIONAL FACTORS

The internal economic situation of Argentina continues unsteady. An abortive revolt during early 1959 was barely put down in time by the Frondizi government, and the general political situation continues unstable. There is considerable labor unrest.

Within YPF, the government's company, some resentment is felt concerning the new contracts. Personnel of YPF feel they were not given proper opportunity to participate in the contract negotiations, and that the companies received too good an arrangement.

YPF has often seemed in danger of bogging down under the sheer weight of bureaucracy. As to finances, YPF operating expenses for 1958 were $207 million. This left a deficit of $22 million. To finance Argentina's goal of oil autonomy, oil circles in Buenos Aires estimate that the country will need between $1.3 billion and $2.3 billion. Projects worth some $925 million have already (or soon will be) contracted by YPF.

Taxation: There is no special oil tax law in Argentina. Recently the income-tax rate was increased to 38% maximum from 35%.

President Frondizi has abolished all import curbs, and ordered a single free peso rate as of January 1, 1959.

SURINAM (Dutch Guinea)

EXPLORATION: The only concession is held by Colmar-Surinam Oil Co., headed by A. L. Marts, of Bartlesville, Okla. An 80% interest has been farmed out to Gulf States Land & Industries Inc., affiliate of Webb and Knapp Inc. A Surinam dentist retains 7% of the stock, and his former American associates retain 13%. Air surveys began in February 1958, and seismic work was to have begun offshore during 1959.

Principal prospect is a sedimentary section on the extreme north shore, where some fringe of Venezuela's formation may extend. Standard Oil Co. (New Jersey) drilled a well some years ago, and encountered metamorphics at shallow depth.

REFINING AND MARKETING: There is no oil refining or production. Domestic requirements of oil are small (about 1,000 b/d).

BRITISH GUIANA

EXPLORATION: There has been very little oil exploration in this area; only one well has been drilled, so far as known. That was by Standard Oil Co. (New Jersey) about 10 years ago. It was abandoned as a dry hole.

During 1958 an oil exploration license was acquired by California Oil Co. (British Guiana) Ltd., a British Guiana corporation and a subsidiary of Standard Oil Co. of California (see map). The license "was obtained pursuant to the petroleum law and regulations of British Guiana." Offshore seismic work has begun by the company.

PRODUCTION, REFINING, MARKETING: There is no production or refining. The California Oil Co. (British Guiana) Ltd. agreed to construct a refinery of about 100,000 tons per year (2,000 b/d) capacity if production reaches at least 200,000 tons yearly (about 4,000 b/d). Marketing needs are very small, and all imported.

OIL LAWS

During 1959 the oil laws of British Guiana were published in *"South America—Basic Oil Laws and Concession Contracts."* This volume is a useful compilation to companies and governments; it covers the entire continent of South America and contains many translations never available before. Other volumes in the series cover the remainder of the world. The volumes are available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

Controlling Statutes: Principal governing statutes are: The laws of British Guiana in Force on July 1, 1952 (Revised Edition) Chapter 199 PETROLEUM (Production); Petroleum (Prospecting and Mining) Regulations 1940; An Ordinance to Make Provision for Restricting and Regulating the Import, Transport, and Storage of Petroleum.

The concession granted to California Oil Co. (British Guiana) Ltd. calls for total payments to British Guiana of less than 50% of net profits, the government to benefit mainly from the 45% income tax on corporations and a small royalty. The agreement provides for a 20% annual depletion allowance.

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BOLIVIA

EXPLORATION: Exploration and production were taken over by the government's YPFB in 1936 *(see WPR 1957)* and private companies excluded until the past few years. With passage of a new liberal oil law, exploration has accelerated; but, despite a number of wildcat tests, no discoveries of major importance have been made. For a concession map see World Petroleum Report 1958, pg. 96. Bolivian Gulf has drilled three dry wells, Mandeyapecua 1, dry at 11,623 ft; No. 2, dry at below 6.500 ft; and at late report had drilled Yoay No. 1 to 15,250 ft, and was fishing at 13,700 ft. Another well, Elcedro 1, is still drilling below 8,515 ft, and still another, Parapeti 1, was rigging up. The three rigs continued operations throughout 1959.

An area held under the Bolivian-Brazilian treaty of 1938 was released during 1958, divided 40% to Brazil and 60% to Bolivia. Internal matters have held up YPFB's decision as to what to do with its 60% and whether to admit bids on it. Brazil's share now has five private Brazilian companies with concessions. They include Pertolanza, Petroleo Andino, Cia. Petrolifera Brasileira, Petroleo de Bolivia, Unio Brasil-Bolivia de Petroleos SA. All are private companies. Petrobras attempted to enter, but was rebuffed.

Chaco Petroleum Co., owned by Tennessee Gas and associates in the former McCarthy concession area, drilled a new well on the Agua Salada structure to 9,532 ft and abandoned it. The second well, Agua Salada 2, was drilling at around 12,000 ft in late 1959.

Fish Engineering Co., on the so-called Bolivian Madrejones concession on the Argentine border, spudded two wells. They were around 12,000 ft and 10,000 ft in late 1959.

The other companies, which include Bolivian Shell; Bolivian California (subsidiary of Standard of California); Sun Oil; Andes Oil (formed by Pure Oil, Hancock, and Sohio); White Eagle International; Bolivian American (affiliate of Cuban Consolidated); Bolivian Petroleum Corp. (affiliate of Drilling and Exploration Co., and Atlantic Refining); and Catract Oil Co., activated surface exploration by aerial, geological, and geophysical surveys, operating around 30 crews at the end of 1958.

Ten rotary rigs of YPFB are active.—Two rigs of Bolivian Oil, three of Gulf, and one of Chaco were drilling at the end of August 1959.

During 1958 YPFB (Yacimientos Petroliferos Fiscales Bolivianos), the government's autonomous oil agency, drilled 10 exploratory and 24 development wells.

Activities have been greatly handicapped by lack of capital. It is expected that US aid will be given during 1960, on the condition that other Bolivian government agencies repay the monies due to YPFB.

YPFB has issued a comprehensive statistical report on oil operations in Bolivia, covering all phases, and going from 1925 to 1958. The title is *Estadisticas Petroleras de Bolivia.* It is available from YPFB's "Departamento de Estadistica" in La Paz, Bolivia.

The Atlantic Refining Co. has acquired a one-year option for an 80% interest in concessions in Zone No. 1 held by Bolivia Petroleum Corp., a subsidiary of Drilling and Exploration Co.

BOLIVIA—Drilling by YPFB, 1938-1958

Year	WELLS DRILLED Oil Wells	Gas Wells	Dry Wells
1938	—	—	—
1939	2	—	—
1940	3	—	—
1941	1	—	—
1942	2	—	—
1943	3	—	—
1944	5	—	—
1945	1	—	—
1946	4	—	—
1947	5	—	1
1948	4	—	2
1949	1	—	2
1950	2	—	1
1951	9	1	1
1952	8	—	2
1953	11	—	1
1954	17	—	—
1955	19	—	2
1956	20	—	5
1957	18	—	6
1958*	17	—	7
Total	152	1	30

*Includes data through Oct. 1, 1958. Note: All the wells in the above summary were drilled by YPFB, the government's oil entity. However, they represent all the drilling in the country during the period 1938-58, since no other companies were active during this period with the exception of one wildcat well completed by Bolivian Gulf in 1958.

PRODUCTION: Production of Bolivia declined from 9,796 b/d in 1957 to 9,413 b/d in 1958; and to just over 8,000 b/d in 1959. The Camiri and neighboring Guaray fields remain the principal producers. YPFB has planned to raise its output in five years to 35,000 b/d, including 25,000 b/d for export; but its difficult financial situation, augmented by the first strike in many years by its labor union, handicaps activity.

TRANSPORTATION: Bolivia currently has 765 miles of crude pipelines, and is adding to them on both sides of the country. Work has been completed on a 215-mile line from Sicasica in the Bolivian interior to Arica on the Pacific Coast (Chile). Capacity is 6,000 b/d initially—with inherent capacity of 50,000 b/d with addition of two pumping stations.

Another ilne is proposed from Villa Montes, Bolivia, across the Paraguayan Chaco to Asuncion, some 450 miles. A French company, Fives-Lille, will build the Paraguay section of the 6⅝-in. line. A second agreement foresees another line (financed by Bolivia) through Paraguay, for export.

REFINING: Total refining capacity in Bolivia is 11,900 b/d (see *World Petroleum Report 1958).* A refinery is planned at Santa Cruz.

OIL LAWS

The oil law of Bolivia and its regulations, along with important contracts within the country such as Bolivian Gulf's pipeline arrangement and oil exploration concession, as well as the Bolivian-Brazilian Reversible Notes and other pertinent legislation, have been translated and are now available in *"South America—Basic Oil Laws and Concession Contracts (Original Texts)."* This publication may be obtained from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

Reversible Notes: The former "Comision Mixta" area, by exchange of ministerial letters of March 29, 1958, was divided into two parts. Area "A," 60%, went to YPFB, the Bolivian government's oil agency. Area "B," the southern 40%, went to Brazil, and will be developed by Brazilian private capital (not the government-owned Petrobras) or by joint Bolivian-Brazilian capital. The concessions granted in this zone are subject to the Bolivian oil law, and obligations will be the same as for Zone 1 (Art. 20). All concessions in area "B" must be applied for within 18 months from March 29, 1958. Any areas not applied for or granted by that time will revert to Bolivia.

On production from area "B," certain restrictions are placed, including obligation to supply Bolivian needs before export. Brazil has the right to buy up to 100,000 b/d of production at the prevailing "international price."

Oil Law Revision: There has been considerable talk of drastic revision of Bolivia's oil code, which was written in 1955 and which has been the major factor attracting oil companies with international capital to the country. The question of revising the oil code, however, is tied into a larger political fight, and there is little chance of any action being taken. The revisions proposed, if adopted, would completely change the complexion of the entire oil picture and probably make operation by international companies almost impossible.

A proposal to amend Art. 161 of the code to give the legislature power to approve contracts in YPFB's zone has more chance of enactment, but would have little effect since this power practically exists at present. There are two such contracts at present: one with Gulf Oil Corp., the other with the TULM group of companies.

NATIONAL FACTORS

Bolivia expropriated the holdings of Standard Oil Co. (New Jersey) before World War II (see *WPR 1957*), but since the advent of political stability in 1953 the general attitude toward international companies in oil has been favorable.

BRAZIL

EXPLORATION: Petrobras invested over 3,000 million cruzeiros in exploration work during 1959. In the Amazon basin, two geological crews are operating in the Tapajos and Japurai River zones, while three others are at work in the Moa, Jurua-Mirim, Azul, and Purus valleys. Fourteen seismograph teams are looking for new oil structures along the upper reaches of the Amazon River and in the Acre territory. Oil shows were found at AR-1A (Arari) and MD-1 (Madeirinha) at 12,977 ft and 8,775 ft, respectively; but neither well yielded oil in commercial quantities under test. At Nova Olinda, where oil was first found outside Bahia in 1955, six wells—two subcommercial and four dry—were drilled to an average depth of 9,100 ft. On the banks of the Amazon River near Manaus, three wildcats were drilled in the Autas-Mirim area, where a 30-ft layer of arenite, saturated with oil, was found; but subsequent tests in the laboratory showed its permeability pre-

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Montecatini Co.
National Cylinder Gas Co.
National Distillers & Chemical Corp.
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Pennzoil Div., South Penn Oil Co.
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Societe Des Usines Chimiques Rhone-Poulenc
Societe Financiere De Transports Et D'Entreprises Industrielles (Sofina) (Belgium)
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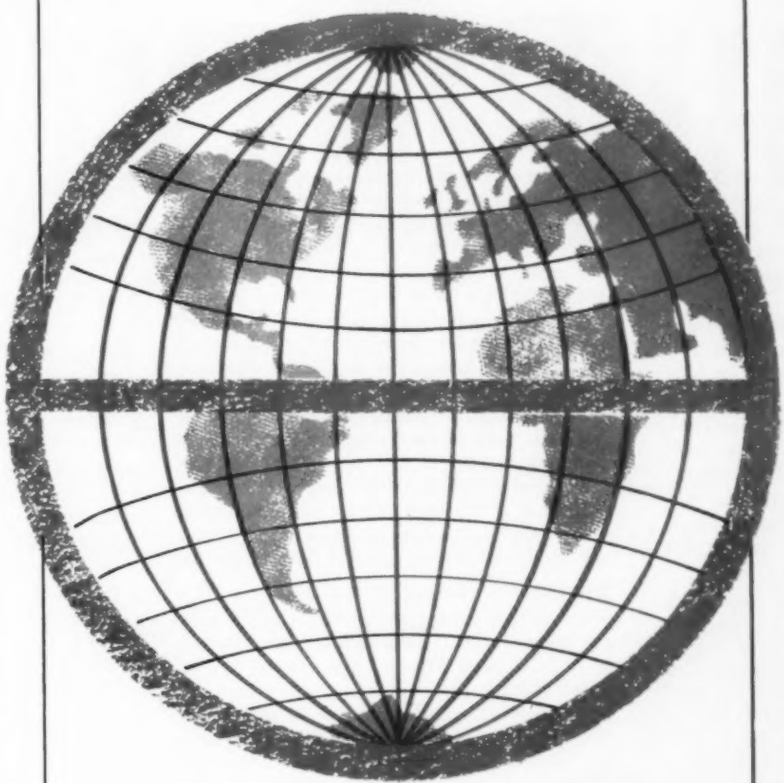

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National Dist. Products
Shell Chemical Corp.
Societe Potasse Et Engrais Chimiques, France
Standard Oil Company (Ohio)
Standard Oil Company of California
ANTHRAQUINONE
Toms River Chemical Corp.
BUTADIENE RECOVERY
British Petro. Chemicals Ltd., England
Cities Service Refining Corp.
Polymer Corp., Canada
Shell Chemical Corp.
CHLORINATED NAPHTHALENE
Petrobras, Brazil
COAL GASIFICATION
Sasol, South Africa
CRACKING CATALYST MFG.
Diakel Corp.
CUMENE
Hercules Powder Co.
Rhone-Poulenc, France
DETERGENT BASES
Colgate-Palmolive
ETHYL CHLORIDE
Shell Chemical Corp.
ETHYLENE
B.A.S.F.—B.P.M., Germany
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Compagnie Francaise de Raffinage, France
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Shell Chemical Corp.
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METHANOL
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TOLUENE EXTRACTION
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BRAZIL—Historical Drilling Review
(1939 through 1957)

Year	Wells Drilled	Oil Producers	Gas	Dry
1939-49	169	92	15	62
1950	33	25	4	4
1951	36	20	3	13
1952	63	37	1	25
1953	78	58	5	15
1954	67	36	6	25
1955	55	28	5	22
1956	57	32	—	25 (incl. 12 strats)
1957	89	49	2	38
Totals (1939-57)	647	377	41	229 (incl. 64 strats)

TABLE I

Years	Crude production (b/d)	Refining of crude: State plants (1,000 bbls/year)	Refining of crude: Private plants	Total (1,000 bbls/yr)
1959	63,194*	38,801	18,579	57,380
1960	95,891	51,850	18,579	70,429
1961	115,068	62,745	18,579	81,324
1962	131,507	87,050	18,579	105,629
1963	150,685	93,225	18,579	111,804

*Jan.-Oct.

BRAZIL—Producing Oil-Field Data
(As of September 30, 1958)

Principal Field	No. of Producers	No. of Wells in Production	Average Production Per Field (Barrels Per Day)
Agua Grande	57	53	36,000
Candeias	99	60	16,000
Dom Joao	176	53	2,700
Mata	26	17	1,600

cluded oil production. Fifteen wells, in all, were spudded in the Amazon basin during the first seven months of 1959.

In the Maranham basin, Wildcat MS-1, at Mangabeira, yielded oil in small quantities under test at 8,304 ft.

In the Sergipe-Alagoas basin, where Brantley Drilling Co., of Texas, contracted to drill 25 wells in 1959, six rigs were operating in June. Earlier in 1959, oil of good quality was found in the Jequia da Praia area and on the Sao Francisco River at 4,510 ft and 8,112 ft, respectively, but the results of tests proved disappointing. Oil was also found in small quantities in Sergipe, at PTA-1 on the Pacatuba-Breja Grande road, 84 miles from Aracaju, the capital, but drilling was suspended in July at 8,032 ft.

In the Bahia Reconcavo, three new oil fields were located in 1959 at Taquipe, Cassarongongo, and Buracica. The first two are expected to yield 7,000 b/d when the necessary installations for disposing of the output are completed. The Buracica wildcat, near Alagoinha in Bahia, about 12 miles from the Agua Grande field, produced 34 bbl per hour during a 10-hour test.

PRODUCTION: The economic advisor to PETROBRAS has compiled the following esti- of crude production and refining in Brazil between 1959 and 1963: (Table I)

The same authority estimates that between 1959 and 1963 Petrobras will spend the equivalent of U.S. $320 million in foreign currencies to purchase materials and equipment and pay for technical services; during the same period the saving in foreign currencies resulting from production, refining and long distance transportaton is expected to reach U.S. $1,500 million.

In 1959 the net expenditure in foreign currencies on imports of crude petroleum and derivates is estimated at U.S. $238 million, as against a saving in foreign currencies, resulting from Petrobras activities, of U.S. $153 million.

Crude production was restricted early in 1959, but was resumed after arrangements had been made to export the surplus over the requirements of the national refineries. Production rose to 68,902 b/d in June and to 72,192 in July.

The number of wells drilled in Bahia since oil was discovered at Lobato in 1939 totaled 858 at July 31, 1959; the number of producing wells was then 545, of which 505 yielded oil and 40 gas.

Reserves: Bahia Reconcavo's recoverable reserves (including those of the recently discovered Taquipe, Cassarongongo, and Buracica fields, now partly estimated) were estimated in December at 610 million barrels, compared with 480 million barrels in December 1958. According to the target recently set by Petrobras crude production is to be raised to 100,000 b/d early in 1960. The potentially productive area consists of 2,509 square miles, while the area proved to date with oil wells is 25.1 square miles. About 502 square miles have been eliminated by exploration.

Footage drilled in 1959 is estimated at 975,000 ft, up 50% over 1958. Expenditures on prospecting and drilling amounted to 3,917 million cruzeiros, against 2,983 million in 1958.

REFINING: The goal of Petrobras in refining is to continue to increase refining capacity with the hope of meeting domestic demand entirely by 1961. Present capacity meets about 62% of requirements.

Capacity expansion projects include: The plant at Mataripe went from 7,000 b/d to about 37,000 b/d in 1959; the Presidente Bernardes refinery has been expanded to 95,000 b/d, and will rise eventually to about 110,000; and a new $40 million 90,000 b/d refinery is now being constructed near Rio de Janeiro, with completion expected in 1960-61. Several other sites are being given serious engineering study for further new refineries—among those reported being Blo Horizonte, Corumba, and Porto Alege.

Bills were introduced in the Brazilian congress which would authorize construction of at least eight new plants in such places as Santa Maria, Itajai, Paranagua, Recife, and Fertaleza. Petrobras itself has opposed the establishment of some of these refineries, pointing out that economic rather than political considerations would guide the selection of new plant sites.

In petrochemicals and other products, Petrobras anticipates considerable growth—a goal eventually of seven plants.

At the new 90,000 b/d Duque de Caxias refinery being built near Rio de Janeiro, plans have been made for a large petrochemical complex. Olefin gases which will be available from the catalytic cracking unit will permit the manufacture of ethylene, benzene, and butadiene.

Petrobras forecasts Brazil's refineries will process 330,000 b/d in 1960, slightly more than national needs.

TRANSPORTATION: An expansion program will bring the Brazilian government tanker fleet to 487,200 tons by the end of 1960. This is more than twice the present 229,000-ton capacity of its 26-unit fleet.

MARKETING: Internal consumption is slowing down. Demand of 238,000 b/d in 1958 was up 7.6% over 1957. This was a healthy jump by world standards, but it was a let-down in Brazil where consumption a few years previously had been going forward at the rate of 13.5% per year. The country's demand pattern resembles Europe's more closely than in the USA. Fuel oil accounts for about 36% of demand; gasoline, 32%; diesel oil, 16%; and other products, the rest. Petrobras is confident it can meet an anticipated demand of 298,000 b/d in 1961 by expanding the country's refining capacity to 330,000 b/d. Exports in 1959 totaled 10 million barrels (about 200,000 b/d) priced at US $2.90 per barrel.

Brazil imported 284,412 bbl of crude oil from Russia early in 1959 under a barter deal involving 60,000 tons of Soviet oil for about 19,000 bags of Brazilian cocoa.

An agreement has been signed by Petrobras with Esso Standard Oil under which the latter will acquire 30 million barrels of Bahia crude, of high paraffin content, valued at US $85 million, during three years, or until the national refineries are equipped to process it.

Gulf Oil Corp. has sold its Brazilian marketing subsidiary, Companhia Brasileira de Petroleo "Gulf," during 1959 to Ipiranga SA Cia. Brasileira de Petroleos, a large independent Brazilian refining and marketing company. Gulf has also entered into an agreement for a long-term supply of crude to Ipiranga.

OIL LAWS

The basic statutes of Petrobras, the government's oil monopoly, and the draft of a new oil law for Brazil have been published in English in an unusual compilation which covers the remainder of South America as well. The compilation is entitled *"South America—Basic Oil Laws and Concession Contracts,"* a word-for-word translation of the basic oil laws and concession contracts for the area. Other volumes in the series cover the remainder of the world. For further information, the publisher should be contacted: *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

The attitude of Brazilian authorities toward international investment has been hostile for a number of years. While no immediate change is foreseen, the recent contracts in Argentina may have opened an avenue to participation by international companies.

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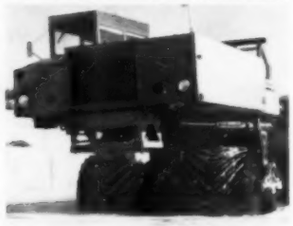
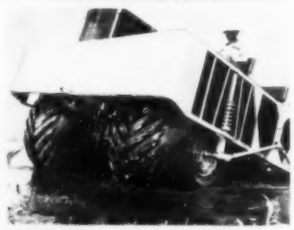


ARCTIC SNOW. Terracruzer vehicle cruises easily over 12 inches of fresh snow on 25% grade with 12-ton load.



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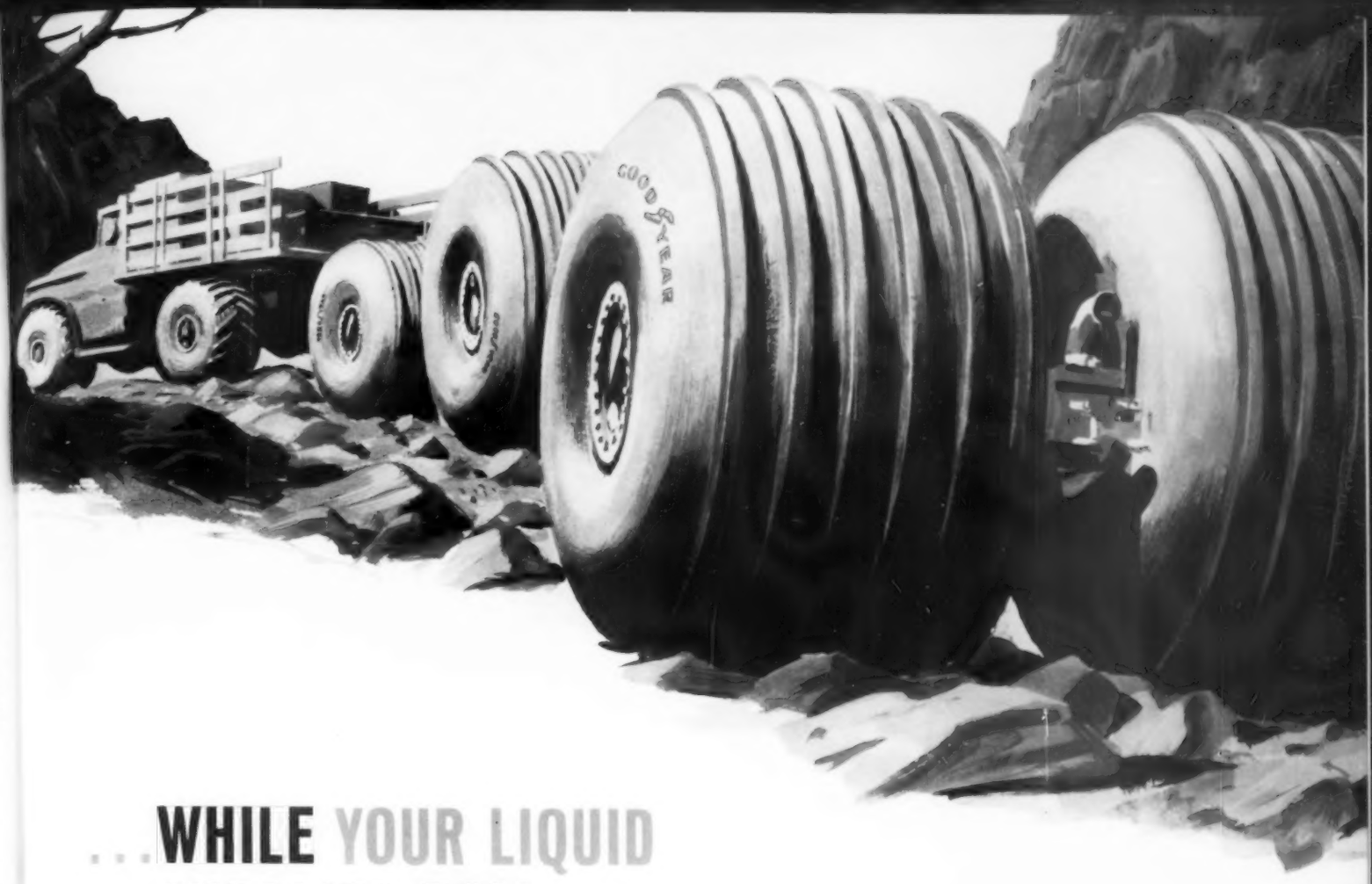

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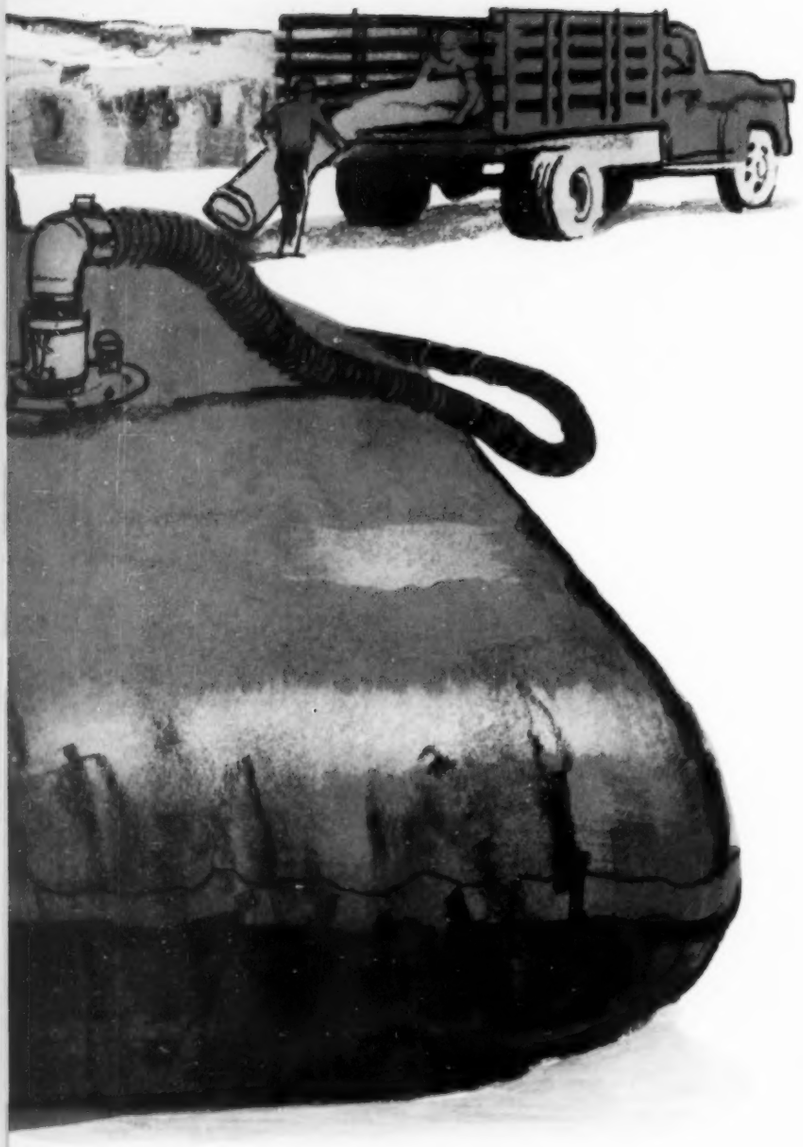
GOODYEAR



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GOODYEAR

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COLOMBIA

EXPLORATION: No major discoveries have been made in Colombia during the past few years, but developments in other countries have brought increasing interest to Colombia. Some companies are even exploring in the remote Llanos areas—where a discovery would have to be very large indeed to justify a pipeline to the coast.

At the beginning of 1960, sixteen wildcat rigs were active: two belonging to Empresa, three to Texaco, two to Colombian Petroleum, one to Shell, two to International, one to Cities Service, one to Nueva Granada, one to Sun Oil Co., two to John Mecom (of Houston, Texas), and one to Mobil Oil. Ten field rigs were operating —four of them for Texaco.

Seventeen operators are active in Colombia. Besides Empresa, they include Shell, Texaco, Colombian Petroleum, International, Richmond, Mobil Oil, Cities Service, and Forrest Oil Corp., the newcomers; and Sun Oil of Colombia, Amkirk Petroleum Co., of Fort Worth, John Mecom of Houston, Sinclair Colombian Oil Co., Intercontinental Petroleum (formerly Michael Benedum of Pittsburgh, who first entered the country 30 years ago), Panoil of Dallas, and Humphrey of Houston.

On the Caribbean coast John Mecom is drilling at Tolu jointly with Empresa on a 75-25% share basis; and in the Chinu area, south of Coveñas terminal, Sinclair Colombian Oil Co. is drilling on the Santa Rita farmout. Amkirk Petroleum abandoned a noncommercial well in the Sinu area—Morocco, 4,828 ft deep—and spudded a new wildcat on the Caribbean coast between Baranquilla and Puerto Colombia. Sun Oil of Colombia drilled two dry wildcats in the Sinu basin, and located a new wildcat on the Gulf of Uraba, the most western portion of the Caribbean coast.

In the middle Magdalena valley, Benedum will start drilling on four new concessions granted to Empresa. Empresa itself drilled an exploration well, Lisama 4, to 15,090 ft. International Petroleum and Sun Oil are drilling in the Provincia block. Cities Service continues drilling in the Santa Clara area, where No. 1 yielded about 400 b/d of heavy crude. Texaco spudded well No. 4 in its Sogamoso field, which yielded a total of around 60,000 bbl in 1958.

Exploratory drilling has begun in the Llanos region, the big prospective area east of the Andes, where several stratigraphic tests had been drilled in 1958 by International and Mobil Oil. Mobil Oil jointly with Shell is drilling a wildcat in the northern Llanos, south of the Barinas basin of Venezuela, and about 600 miles from the coast, at La Heliera. Cost of the well (including previous seismic and gravimetric surveys, transport, and location) is reported at about $3.5 million. On a promising structure 65 miles east of Bogota, Texas Petroleum Co. is drilling its wildcat Guavio 1. Transport of rig and material had to be carried out by air; and heavy rains have delayed drilling, which reportedly has reached about 1,000 ft to date.

Summarizing the results of recent exploratory drilling in Colombia, principal recent discovery has remained the Ciccuco field, opened in 1956, where 16 wells have been drilled so far, yielding from the Cretaceous limestone more than 1,000 b/d average per well of high-grade crude. Because of the big gas potential, building of a gas line to Barranquilla has been considered. The Yariguy field of Shell in the middle Magdalena yields about 10,000 b/d from 17 wells.

Other discoveries of recent years such as the Sogamosa and Lebrija fields in the middle Magdalena or Gualanday in the upper Magdalena valley have added little to the output of Colombia.

New concessions have not been granted since the middle of 1958, with the exception of the abovenamed Empresa-Benedum lots. They amounted at that date, according to official figures, to 8,906,634 hectares, of which 5,174,930 were granted in western Colombia and 3,731,-702 hectares in the Llanos area (see *WPR 1959*).

Socony Mobil had four discoveries during the year ended July 1959. They included the wells listed in an accompanying table. They were drilled by Mobil's affiliate, Colombian Petroleum Co.

PRODUCTION: Crude output increased rapidly in 1959, reaching 155,755 b/d in August.

As of June 30, 1959, a total of 2,061 wells was producing in Colombia, of which 184 were flowing, 1,852 pumping, and 25 by gas-lift. More than half of this number corresponded to Empresa's De Mares fields, with 1,110 pumping and 21 flowing wells.

REFINING: Refining capacity has remained nearly static for the past few years, with no important changes in 1958 or 1959. The 26,100 b/d Intercol plant at Cartagena completed its second year of operations in 1959. Ecopetrol has expanded its Barrancabermeja refinery's LPGas plant.

TRANSPORTATION: Colombia's pipelines, which totaled 790 miles of crude trunk lines on January 1, 1958, were expanded slightly in 1959. On March 20, 1959, the South American Gulf Oil Co. (SAGOC), a Colpet subsidiary and owner of the Tibú-Coveñas pipeline, completed a 142-km 12-in. crude pipeline from Colpet's Cicuco field near Mompos to the Coveñas loading terminal.

COLOMBIA—Wells Drilled by Colombian Petroleum Co.
July 1, 1958 to July 1, 1959

Name	Total Depth (Feet)	Status	Location
La Raya-2	8,537	Dry	Department of N. Santander 18 mi NNW of Tibu
Oru-1	4,820	Sub-commercial oil discovery	Department of N. Santander 6 mi W of Tibu
Oru-2	4,575	Dry	Department of N. Santander 6 mi W of Tibu
Oru-3	3,280	Oil discovery	Department of N. Santander 12 mi W of Tibu
Oru-4	5,120	Dry	Department of N. Santander 6 mi W of Tibu
Oru-5	4,120	Dry	Department of N. Santander 11 mi W of Tibu
Boquilla-1	5,188	Oil discovery	Department of Bolivar 12 mi SW of Mompos
Violo-2	4,910	Dry	Department of Bolivar 7 mi SW of Mompos
Lobita-1	8,284	Dry	Department of Bolivar 4 mi S of Cicuco field
Zenon-1	6,424	Oil discovery	Department of Bolivar 8 mi WSW of Mompos
Escondida-1	5,275	Dry	Department of N. Santander 1 mi W of Sardinata field

OIL LAWS

During 1959 the oil laws of Colombia were published in an unusually complete compilation which covers the remainder of South America and (in other volumes) the rest of the world as well. The publication is entitled *"South America —Basic Oil Laws and Concession Contracts (Original Texts)."* It is a word-for-word translation of all applicable laws in Colombia, and should result in considerable saving to oil companies interested in operations there. It is available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

Debate on Colombia's oil law continued, with no action taken in 1959.

A drastic revision of the basic oil law has been proposed, as outlined below.

COLOMBIA—SUMMARY OF DRAFT OIL LAW

Art. 1—Reduces from 5 to 4 years the initial exploration period in the eastern region, and from 7 to 5 years the initial exploration period elsewhere. The Pacific Coastal area, west of the summit of the Western Range, is submitted to the same rules as the eastern region. Art. 2—Adopts American dollar for rentals in future contracts, causing an increase in Colombian pesos. Rental during exploitation equal to full amount during last year of exploration. Formerly it was one-half. Art. 3—50% of concession area to be turned back to the nation during the first year of the exploitation period in continuous or discontinuous portions of not less than 5,000 hectares. The concessionaire can select these portions. This article does not apply to concessions of less than sixty thousand hectares area in the Eastern Region, nor to those of less than 15,000 hectares in the rest of the country. Art. 4—Submits to auction areas of contracts or applications terminated by any legal cause, thus creating a new system for all the lands returned to the nation. Art. 5—Increases from 5% to 10% the limit for the amortization deduction provided for in Art. 66 of the Petroleum Code. Art. 6—Depletion allowance of 15% established for oil exploitation initiated after January 1, 1955. This 15% deduction is also applicable to exploitation initiated before such date only to the extent of the amount invested in new explorations during the corresponding year. For the Eastern Region and the Pacific Coastal Region, the allowance for depletion will be 20% of the value of the production, up to 45% of the net taxable income. For exploitation initiated after Jan. 1, 1955 and for those started in the future, income and complementary taxes cannot be more than 40% of the net taxable income. Art. 7—Authorizes the government to reorganize the Ministry of Mines and Petroleum. Art. 8—Authorizes the government to make budget transfers in connection with Art. 7. Art. 9—Repeals or derogates Decree Law 2140, 1955, and gives legal force to Extraordinary Decree #3050 of Dec. 13, 1956.

MARKETING: Stagnation of the economy in 1958 and 1959 was reflected in low consumption, almost unchanged from 1956 and 1957 levels. Excluding international bunkers, products consumption was 16,695,000 bbl in 1958, only 0.4% above 1957 and about 1% above 1956. Primarily responsible for the lack of increase in demand, which had been rising at 15% per year, is the virtual prohibition of imports of automotive vehicles. Demand for inter-

COLOMBIA—Crude-Oil Exports

	Volume (Barrels)	Value (US $)
1955	25,380,251	61,484,103
1956	29,323,581	71,129,496
1957	26,964,332	72,331,680
1958	23,819,154	65,093,644

national bunkers rose from 2,013 b/d in 1957 to 2,861 b/d in 1958, mainly due to attractive peso prices quoted on this fuel. With the Cartagena refinery now operating near capacity, Colombia is virtually self-sufficient in products. In 1958 only 4% of total products demand was filled by imports, against 16% in 1957.

Crude exports in 1959 showed a 3.5 to 4 million-barrel increase as a result of the completion of a 12-in. crude line from Colpet's Cicuco field near Mompos, on the lower Magdalena, to the Coveñas export terminal. This line permitted Cicuco production to increase by 10,000 b/d.

NATIONAL FACTORS

The government's attitude seems to have become more favorable to international investment in recent years. Ministers of Mines and Petroleum who have held office recently have clearly expressed themselves as being in favor of international investment in the industry, and have observed that Colombia would be unable to develop her petroleum resources without such international investment. The current Minister of Mines and Petroleum has unequivocally condemned the idea of nationalization of the industry.

Congressional opinion, however, has not been so uniformly favorable. In 1958, members of the Comité Pro-Nacionalización del Petroleo who appeared beforé extended hearings of a House Committee secured substantial publicity of ill-founded hostile charges against the industry, and were successful in introducing a bill which, while not actually nationalizing foreign petroleum companies, would force them to suspend operations through higher taxes and other punitive measures.

CHILE

EXPLORATION: Chile's oil production and exploration industry is one of the oldest oil monopolies of the world, established in 1926 and maintained since that time. The State company is Empresa Nacional de Petroleo (ENAP).

Exploration has been expanded to northern Chile, to the province of Tarapacá, where principally at Pedernales in the Puna de Atacama significant oil seepages occur, related probably to Mesozoic deposits, neighboring granite and volcanics. Geological surveys have been begun, an airborne magnetometer survey carried out, and seismic surveys started in the region north of Iquique.

PRODUCTION: Development by ENAP continue its steady progress. The production, which proceeds from the Lower Cretaceous Spring Hill sands at about a 7,000 ft-depth, increased in 1958 by more than 28% to 15,253 b/d, and increased further in 1959 to about 17,247 b/d, 10% over the preceding year's average. Highest output reached so far was on August 23, 1959, with 19,300 b/d. Cumulative output of the Magellan fields exceeds 25 million barrels. Total output for 1959 is estimated at 6.3 million barrels.

The biggest share of the output is from the Cullen pool, with more than 30% of the total. Cumulative production of the Cullen pool is nearly six million barrels. Second is the Sombrero pool, with about 523,000 bbl in the first half of 1959. Victoria Sur, located in the western part of the fields, yielded about 245,000 bbl. Tres Lagos in the south, discovered in 1957, yielded about 160,000 bbl; and Gaviota, the most southern extension on the NW-SE trending structure, yielded around 35,000 bbl in the first semester of 1959. Punta Delgada and Delgada Este, the northern extension, discovered on the continent on the northern side of the Magellan Strait, increased from 880 bbl total in 1958 to around 12,600 bbl in the first semester of 1959.

In 1958, 74 wells were completed, of which 28 yielded oil, 10 gas, and 36 were dry. Wells completed in the Magellan fields to July 31, 1959, totaled 469, of which 176 yielded oil, 76 gas, and 215 were dry. 130 of these wells were drilled for exploration; and 17 of them yielded oil, 21 gas, and 92 were dry, representing a success rate, including the gas wells, of nearly 30%. At the end of 1958, a total of 101 wells were in production, of which 93 were flowing and 8 pumping.

REFINING: The new pipeline and distributing firm SONACOL (established in 1957) completed during 1958 a 73-mile 10-in. 30,000 b/d products line from Concón refinery to Santiago. ENAP has constructed an extensive system of oil and gas pipelines, which measures about 186 miles. Expansion of the 20,000 b/d ENAP refinery at Concón is planned to include a 24,000 b/d atmospheric and vacuum distillation unit; 12,000 b/d Orthoflow fluid catalytic cracker and gas-recovery facilities; 6,000 b/d catalytic desulfurization and reforming unit, and 1,100 b/d alkylation unit. Completion was scheduled for early 1960. After expansion, the Concón refinery will produce:

	Barrels Daily
Avgas	1,185
Gasoline*	16,000
Kerosine	3,050
Diesel oil	12,400
Residual fuel oil	8,600
LPGas	85
Residual gas (in fuel equiv.)	651

*80% of 78-octane, and 20% of 85-octane premium gasoline.

Empresa Nacional de Petroleos plans to construct new refineries at Antofagasta and Concepcion. The former will treat crude transported by the pipeline being constructed from Sicasica in Bolivia to Arica on the coast in the extreme north of Chile, while the latter will handle increased production from the wells in Magallanes.

A new lubricant-blending plant at Vina del Mar, Chile, is being operated by a new joint company formed by Mobil International Oil Co. and its Chilean distributor of lubricants, Cia. de Petroleos de Chile (Copec). Initial capacity is 78,000 bbl per year, which can easily be doubled. A 10-in. pipeline, laid 400 ft offshore, connects to buoys, where tankers discharge blending stocks.

OIL LAWS

The congress is again considering an oil law which will permit participation by private international capital. The controlling law at present is Law 4218 of February 15, 1928. This law reserves to the State all exploration rights, refining, and distribution of petroleum products. ENAP was established by Law 9618 of June 19, 1950, with statutes approved by Supreme Decree

1208 of October 27, 1950. The latest draft law (see *World Petroleum Report 1958*) still reserves the Magellanes area for ENAP. Alessandri, the president elected in 1958, has stated he favors entry of private oil companies in the same manner as in Argentina, but there are obstacles he may not be able to overcome. As things stand now, ENAP does not have the power to conclude contracts as YPF did in Argentina. The provisions necessary to give ENAP this power are not included in the draft law either, since it will not permit ENAP to contract out the Magallanes area.

NATIONAL FACTORS

Principal deterrent to oil investment is, of course, the oil law; and chances for its revision are slight due to the political situation.

Senator Jorge Alessandri was confirmed as the new president of Chile for a six-year term on October 24, 1958. He is a minority president, who has the support of the Agrarian Labor Party and of the Conservatives, but who lacks the support of the Christian Democrats and the Radicals. The former have announced their intention of following an independent course. The Radicals, an important center party, must lend their support to Alessandri to get a new oil law through with the necessary provisions. It is doubtful they will do that. Outside of oil, Chile's attitude toward international investment is very liberal.

ECUADOR

EXPLORATION: The history of exploration in Ecuador goes back many years, and it includes a major (and unsuccessful) exploratory effort before World War II in the eastern part (Oriente) by Jersey Standard and Shell. There have never been any large discoveries made, and 1959 was no exception.

Oil development has been hampered by low domestic ceiling prices imposed by the government. Drilling declined to 42 completions in 1958, and only 25 wells were completed in 1959, of which 14 yielded oil. 1,629 wells were producing oil at the end of July, 1959, yielding an

average of less than 6 b/d per well. 1,598 were pumpers.

Tennessee Gas Transmission Co., which acquired the holdings of Manabi Exploration Co., is exploring. Other independents have acquired concessions on the Tertiary coastal belt as well as United Fruit Co. in the south, but no new discoveries have been reported so far. California Ecuador Oil Co. is reported to have proposed offshore drilling in the Gulf of Guyaquil by the drilling barge "Rincon."

REFINING, MARKETING: There are two refineries, one owned by Anglo-Ecuadorian Oilfields Ltd. at La Libertad, with 5,200 b/d capacity; the other, owned at Cautive by Managi Exploration Co., has 450 b/d capacity. Both are skimming plants. A 7,700 b/d distillation unit and a 6,000 b/d thermal cracker had been under construction by Anglo-Ecuadorian when, in 1958, work temporarily was halted due to the price situation. Work was resumed after a price increase in July 1959.

As accompanying tables show, production has declined steadily in recent years. Consumption has risen steadily, with refining capacity falling steadily behind, and extensive importation of products has been necessary to fill the gap. Refining capacity is insufficient to meet national needs, and about 25% to 30% of production is exported. Principal reason for lack of refining capacity is the artificially low product price level, which has recently been improved by the mentioned oil product price increase.

ECUADOR—Oil Product Imports

(In Barrels)

Year	Gasoline	Diesel	Residual
1957	558,297.31	134,047.62	200,476.18
1958	562,861.00	117,291.93	76,100.00
1959 (10 Months)	467,986.00	62,434.50	109,198.42

ECUADOR—Drilling in 1959

Productive Wells		Drilling Wells		Dry Wells	
Anglo Ecuadorian	Tennessee del Ecuador	Anglo Ecuadorian	Tennessee del Ecuador	Anglo Ecuadorian	Tennessee del Ecuador
12	2	3	5	—	3

OIL LAWS

The oil law of Ecuador, Petroleum Law No. 70 of 1937 and its amendments of April 8, 1938, together with the regulations, have been published in a very useful new compilation of South America's oil laws, entitled *"South America—Basic Oil Laws and Concession Contracts."* It is a word-for-word and reliable translation of the applicable laws. For information concerning it, those interested are invited to write *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

For a summary of Ecuador's petroleum law, see *World Petroleum Report 1957*. There have been no significant changes. The government is now said to be asking for "credentials" from concessionaires, which is not provided for in the law.

There are also some loopholes in the law, such as provision for "public works" by the concessionaire instead of payments, and similar provisions.

NATIONAL FACTORS

The governmental attitude toward international investment is liberal, as covered in *World Petroleum Report 1957*. General oil investment favorability is good—with a good history as regards oil: relatively low payments for social-security taxes and oil law fees, and royalty, which are relatively low for Latin America.

Taxation: Oil companies are subject only to the taxation specified in the oil law and to general taxes (such as the stamp tax, etc.). They are not subject to taxes on capital.

Imports: Exemption is given from import duties and licenses on equipment for operations.

Exchange: Oil companies are guaranteed profits remittance and repatriation of capital invested. Freedom to export and to use profits derived from exports is also guaranteed.

Political Stability: Political stability has been good in recent years. The favorable attitude of the government has been frequently expressed by government officials.

ECUADOR—Consumption of Oil Products

(In Barrels)

Year	Gasoline	Kerosene	Diesel	Gas Oil	Residual	Lubes	Other
1957	1,348,752	219,084	452,246	1,821.00	899,488	2,609.71	11,008.38
1958	1,392,864	243,877	505,069	—	938,139.50	3,043.62	16,869.60
1959 (8 Months)	937,117	159,812	359,034	—	511,687.60	2,037.02	21,440.54

ECUADOR—Refinery Runs

(In Barrels)

Year	Gasoline	Kerosene	Benzine	Diesel	Gas Oil	Residual	Lubes
1957	632,045.24	219,558.32	11,357.76	352,641.24	3,948.81	805,280.22	1,799.73
1958	725,531.92	240,216.33	11,741.09	444,726.91	1,433.15	929,563.40	2,982.95
1959 (8 Months)	508,522.80	156,361.69	—	347,828.50	—	541,322.40	—

PERU

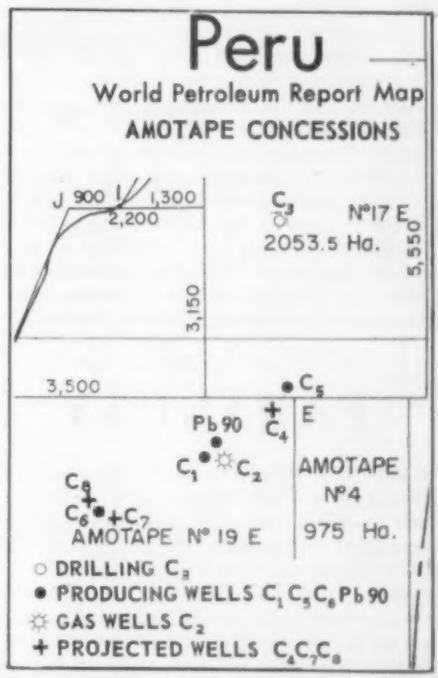
EXPLORATION: Peru has proved one of the biggest exploration disappointments of the post-World War II period. No major significant discoveries have been made in recent years, although some minor finds were made in 1959 in various coastal areas.

Peruvian Pacific acquired the rights of Douglas Oil Co., which had withdrawn; took about 92,000 acres additional concessions on the shelf; and brought Richfield's 600-ton drilling boat Rincon from California for drilling in deeper waters. The first well, about 2½ miles offshore Lobitos in a water depth of 150 ft, yielded only gas shows and was abandoned at 5,662 ft. The second well, about three miles offshore from Punta Lobitos in water of 216-ft depth, struck oil sands in the lower Eocene Parinas formation from 2,807 ft-2,996 ft and on the test flowed 416 b/d of 38-API crude through a ¼-in. choke. A third well, about 2½ miles farther north, yielded about 200 b/d. A fourth well was drilled offshore from Cabo Blanco and yielded 360 b/d at a 920-ft depth and around 200 b/d additional at about 1,400 ft. A fifth well was recently drilled offshore from Lobitos to 6,363 ft total depth, but was dry. All wells have been closed, and drilling temporarily suspended. The commercial importance of these is questioned because of the heavy cost of offshore drilling and operation.

Petrolera Peruana, the national company, which drilled 12 wells in its Mirador concession south of the Chira River, bordering International to the south, and got 11 producers, sold its entire holdings, including concessions offshore Talara and about 500,000 acres in eastern Peru, to Belco Petroleum Corp. of New York. Petrolera hal an output of 114,456 bbl total in 1958 and 45,653 bbl in the first half of 1959, or about 250 b/d. Belco is shipping two rigs from Venezuela; it started drilling in November 1959, employing one rig for directional drilling on the shelf.

Petrolera Amotape continued successfully drilling in its concession on the northern coast, adjoining to the north the Lobitos concessions. Well C-12 in the Carpitas area yielded from the Upper Eocene Verdun sands at about a 2,300-ft depth, after sand fracturing in the test, about 400 b/d; and C-14, from the same sand, 354 b/d. C-13, completed at the end of September, yielded about 200 b/d. Total output for September amounted to 8,820 bbl from six producing wells. The company, which so far has only tested the Upper Eocene sands, proposes to extend drilling to the Middle Eocene Talara and Lower Eocene Salinas formations which offer prospects for a considerably higher output.

In the Amazon basin of eastern Peru, the



German syndicate of Deutsche Erdoel, Wintershall, and Elwerath (associated with the national El Oriente Co.) completed in the Maquia field,

discovered in 1957, at the end of 1958 and beginning of 1959, wells No. 8 and 9, and about 2,150 ft deep, which yielded 300 b/d each, and well 10 which yielded about 150 b/d. Drilling was then suspended. After building a 4-mile pipeline to the Ucayali River and storage tanks at Puerto Oriente and acquiring two 8,000-bbl barges for river transport to Manaus in Brazil, commercial production at about 700 b/d began before the end of 1959. Regular shipments of crude are now reported from Maquia to the refinery at Manaus.

About 11 miles southwest, on a smaller closure of the structure, the wildcat Pacaya was drilled to 4,528 ft; it yielded only shows of oil, and was abandoned. Investment of the German companies so far has been estimated at about $5 million.

Ganso Azul, which in 1958 had to reduce operation because of damage to two river barges, recently increased its output—operating 11 to 15 wells. Production for the first six months of 1959 amounted to around 2,200 b/d. In August 1959, 75,779 bbl were shipped to the government refinery in Iquitos and to the Manaos refinery in Brazil.

Texas Petroleum Co., after drilling a dry wildcat to 7,591 ft in Yurimaguas, abandoned its share in the Yurimaguas concessions and about two million acres in the Maranon area; and in June 1959 ceased its operations in Peru after an expenditure of 116 million soles (about $5 million), but it retains around two million acres of concessions in eastern Peru.

Fifteen companies retain nearly 30 million acres in eastern Peru. Cerro de Pasco Petroleum Corp. has been one of the most active—completing seismic surveys of most promising areas, which indicated five structures. The company proposed to start drilling in 1960. No drilling was carried out during 1959 in the Peruvian Amazon basin, activity being restricted to geological and geophysical surveys.

PRODUCTION: Crude production declined 2.5% in 1958 to 51,320 b/d; it continued dropping in 1959, to about 48,500 b/d in July, because of suspension of drilling by International Petroleum Co. and Cia. Petrolera Lobitos, the most important producers in the country, both operated by International. Finally, by decree of July 25, 1959, the government increased domestic prices for regular 66-67 octane gasoline to nearly US 15 cents at the present exchange of 28 per dollar, including taxes—doubling the price for extra gasoline of 76-77 octane and tripling the prices for industrial kerosine and diesel. The government will shortly submit a law to Congress adjusting the concessions of International Petroleum and Lobitos Co., to the Petroleum Law No. 11780 of 1952, which establishes the 50% split of net earnings, but guarantees international market price for the domestic market.

Drilling was renewed by International in August 1959 by five rigs, and general improvement is expected for the future. Production of Peru in August 1959 amounted to 48,640 b/d of crude. Output of International for the first six months of 1959 amounted to 4,123,587 bbl from Brea-Parinas field and 3,692,892 bbl from Lobitos fields. In addition, 414,026 bbl of condensate were recovered in Brea-Parinas and 112,937 bbl of casinghead gasoline from the Lobitos fields. Total crude output of Peru for the first half of 1959 amounted to 8,730,000 bbl, a decline of about 7% under the preceding year's average.

Empresa Petrolera Fiscal's output, almost entirely from its Organos field (Zorritos is completely depleted), declined slightly in the first half of 1959 to 2,400 b/d. Drilling was carried to the lower sands of the oil-bearing Talara formation, the Nure and Patria section. Total production in 1958 was 911,900 bbl. About 160 to 170 wells are currently producing.

Peruvian Pacific Petroleum Co., subsidiary of Cities Service and Richfield Oil Corp., produced in the first six months of 1959 around 80 b/d from two producing wells in its concession east of the Lobitos fields, where already the shoreline facies of the Tertiary formation predominated. Production declined from 56,613 bbl in 1958.

1958 Review: A total of 139 wells was completed in Peru during 1958, as shown in the accompanying table.

PERU—Drilling in 1958

Exploratory wells drilled:	**14**
Oil Producers	5
Gas Producers	—
Dry	9
Development wells drilled:	**125**
Oil Producers	110
Gas Producers	2
Dry	13

Domestic marketing in 1958 added up to 14,925,000 bbl, as follows: Motor gasoline, 5,422,000; kerosine, 2,195,000; diesel oil, 3,440,000; heavy fuel oil, 3,168,000; aviation gasoline, 358,000; lubricants, 193,000; asphalt, 85,000; LPGas, 64,000.

Crude-oil production in Peru in 1958 was 51,321 b/d, while natural-gasoline output was 1,013,777. Crude runs to stills came to 16,105,497 bbl.

MARKETING: Domestic consumption in Peru amounted in 1958 to about 41,600 b/d, more than 80% of national production. Due to the new price structure, outlook for increased production in the coastal area is favorable because of the considerable reserves of the Lobitos fields, attractive prospects in the adjoining Amotape area, and increasing interest for development on the shelf.

REFINING: The 45,000 b/d refinery at Talara of International Petroleum Co. supplies about 98% of the domestic market, and its capacity is being increased. Run to stills amounted in 1958 to 15,161,247 bbl. Exports by International amounted to 3,063,507 bbl of products, of which 2,062,555 bbl were exported to Chile, 266,373 bbl to Ecuador, and 237,885 to New Zealand. Another refinery in southern Peru has been proposed.

OIL LAWS

Peru's oil law and its regulations have been translated and published in a new and recommended publication entitled *"South America—Basic Oil Laws and Concession Contracts."* It is available through, and all inquiries should be sent to, *Petroleum Legislation, Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Among the controlling statutes of Peru are: Law 11,780 of March 12, 1952 (The Petroleum Law); Supreme Decree No. 1 of June 10, 1952 (regulations to the Petroleum Law); Law 12,376 of July 8, 1955.

For a résumé of the provisions of Peru's oil laws, see *WPR 1958* and *1957*.

By decree of July 26, 1959, the government eased controls on oil products set many years ago, and raised prices. The price increase should make considerable difference to companies presently operating in the country; they had sustained losses on domestic sales operations each year as consumption levels rose. One result of the price increase has been that International Petroleum and Cia. Petrolera Lobitos have agreed to submit their holdings in western Peru to Petroleum Law No. 11780 (see PRODUCTION section hereinbefore).

NATIONAL FACTORS

Under a new and liberal government, Peru's investment outlook improved considerably during 1959. A price increase given to domestic producers and marketers prevented a complete breakdown of the distribution industry there, and the government's attitude appears to be favorable to increased investment activity.

PARAGUAY

EXPLORATION: Interest in oil possibilities slowed in late 1959 when The Pure Oil Co. and associates suspended exploratory drilling operations in Paraguay. The group headed by Pure's subsidiary, Pure Oil of Paraguay, is retaining three million acres in the northwest Chaco territory near the Bolivian border. There are no immediate plans for further drilling. Associated with Pure in the Paraguayan venture are Gulf, Sinclair, Tidewater, and Williams Bros. Corp.

A total of four test holes was drilled at widely separated locations in the Chaco. The fourth test, the Mendoza No. 1, at 1,927 ft encountered natural gas which was uneconomic to produce because of the well's remote location. It was deepened to over 10,000 ft without discovering oil. These tests were extremely expensive and located in inaccessible jungle country, necessitating a 200-mile access road. The drilling crew was attacked several times by Moro Indians.

PRODUCTION AND TRANSPORTATION: There is no production of crude oil. As contained in *World Petroleum Report 1958*, p. 138, a pipeline is proposed from Villa Montes in Bolivia to Asuncion, Paraguay. The French company, Fives-Lille, was to have the contract for the 422-mile line; but during 1958 it was reportedly canceled and re-awarded to Williams-McWilliams (no relation to Williams Bros. Co.) of New York, for a total of $9 million, including a 3,000 b/d refinery. This has not been confirmed, however. A later published report stated the contract, including a refinery at Villa Hayes, had been given to the Venezuelan firm, Petromina.

REFINING: There is no refinery, but during 1958 Esso Standard of Paraguay proposed erection of a $3 million 3,000 b/d refinery in

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VENEZUELA
● ANACO ● BARINAS ★ CARACAS ● MARACAIBO

Asuncion and establishment of a fleet of river craft to transport the crude oil and refined products.

NATIONAL FACTORS

On a net basis, the investment climate is good. The attitude toward the United States is traditionally friendly, and there are no instances of expropriation or similar detrimental acts. There is no exchange control on the currency unit, the guarani, which is worth about US 1.6 cents. Labor legislation is nonexistent for oil. Taxation reaches a maximum of 21%. Substantial tax inducements are given. All these factors are reviewed in detail in *WPR 1958*, p. 139, 140.

Principal unfavorable factor is the terrain, which is very inaccessible. During 1958, marauding Moro Indians raided a Pure Oil Co. camp, reportedly wounding one person with a spear.

An unbroken string of dictators has not affected oil operations, since Union Oil stated its previous operations had gone on without hinderance through political turmoil. There appears to be little training or economic basis for democracy, but all political parties profess allegiance to the idea. The president is General Alfredo Stroessner, elected to a second five-year term about three years ago. He instituted a free exchange rate, which has introduced considerable monetary reform. The economic situation remains precarious, however, with pre-capita income only $116 per year, and with average wage of an adult male worker in Asuncion $1.00 per day. Relatively large amounts of aid are given by the United States.

PARAGUAY—Imports 1958
(Thousands of Barrels)

Gasoline	301
Kerosine	81
Gas Oil	95
Other diesel oil	4
Fuel oil	132
Lubricating oil	17
Total	630

Source: U. S. State Dept., Asuncion.

URUGUAY

EXPLORATION: During 1959 three wells were drilled in the Santa Lucia basin. They were SL 9.CL, which went to 6,200 ft; SL 10.Col, which went to 994 ft; and SL 11.Psl, which bottomed at 5,230 ft in the Precambrian. No productive horizons were found. All were drilled by ANCAP, the government's oil monopoly.

PRODUCTION: There is no crude production. There are some oil-shale deposits in the north of the country, but the government does not consider them workable.

REFINING: There is one refinery, a 28,000 b/d plant located at Montevideo. It has 2,000 b/d thermal cracking facilities, plus a 750 b/d vacuum distillation unit and a 350 b/d asphalt unit. The plant is owned by the government through the Administration Nacional de Combustibles, Alcohol y Portland (ANCAP), and an expansion program has been under way to double capacity and output. New units will include a 28,000 b/d crude unit, a 10,000 b/d vacuum unit, a 5,000 b/d Orthoflow "B" unit, a 3,000 b/d Sinclair Baker-Kellogg catalytic reformer, and a 3,000 b/d asphalt unit. The plant, which will produce 94-octane premium gasoline and 84-octane regular as well as aviation gasoline, is expected to be completed and in operation in 1960.

Total runs to stills at ANCAP's refinery during 1958 were 8,222,000 bbl. Fuel oil was the largest product, with 3,677,000 bbl.

MARKETING: Consumption during 1958—based on the figures for imports less exports—was about 9,703,000 bbl.

Early in 1958, the Soviet Union and Romania bid on shipment of crude to Uruguay, and won out against western oil companies, with discounts below international prices ranging from 2% for 270,000 cubic meters (about 1,700,000 bbl) of crude up to 9% for 70,000 cubic meters (about 441,000 bbl) of gas oil. The first shipment of Russian crude arrived at the refinery during mid-1958.

OIL LAWS

Art. 10 of the law of October 1931 created the Administracion Nacional de Combustibles, Alcohol, y Portland (ANCAP) to control all petroleum activities. It provides that all hydrocarbons, if found, are the exclusive property of the State. The law also contains detailed provisions for the regulation of oil imports and refining, granting a monopoly over such activities to ANCAP.

VENEZUELA

EXPLORATION: For a brief history of Venezuelan activities, see *World Petroleum Report 1957*, p. 265. Subsequent editions give details on activities up to early 1959.

During 1959 exploration slowed progressively until it almost reached a standstill at the end of the year. Only one seismic party was working, and 51 rigs were drilling (of which about 15 were wildcat rigs); compared with 84 rigs working at the end of 1958 and 208 party-months during 1958.

1959 Summary:* Oil operations during 1959 declined (except production) quite severely, as the impact of recent governmental decisions made itself felt. In very brief form the year's operations were as follows:

Operations: The following table shows a constant decline in three significant indexes—rigs running, wells completed, and exploration parties active—accompanied by maintenance of production at near-record levels:

	1959 Operations			
	Production (b/d)	Wells	Rigs	Field Parties
1st Qtr	3,014,000	210	80	24
2nd Qtr	2,691,000	190	72	21
3rd Qtr	2,564,000	145	60	13
4th Qtr	2,814,000	165	55	11
Average	2,770,000	710 (Total)	67	17

PRODUCTION: Industry production averaged 2,770,000 b/d, about 6% more than in 1958. All-time records established by individual companies were as follows: Mene Grande, 551,000 b/d; Phillips, 63,000 b/d; San Jacinto, 43,000 b/d; Signal, 34,000 b/d; Sinclair, 74,000 b/d; Texas, 68,000 b/d; Sun, 80,000 b/d; Shell, 954,000 b/d. The greatest gain was shown by Phillips, which began producing from prolific Lake Maracaibo wells about the middle of the year.

Cumulative production has now reached approximately 12,930,000,000 barrels. Reserves were estimated at 17,177,000,000 barrels at the beginning of 1959.

Wells: Wells drilled in 1959 totalled about 710, of which 120 were wildcats and 590 were development or outpost wells. These figures represent a 45% decrease as compared with 1958.

Rigs: Rigs in operation (excluding those on work-over and repair) averaged 67 during 1959—about 29% fewer than 1958's average 94.

Field Parties: Field-party activity, with an average of 17 parties in the field, was down about 53% from 1958.

Trends: While production so far is holding up well, the basic activities supporting production have reached their lowest ebb in ten years:

	Production (b/d)	Wells	Rigs	Field Parties
1959	2,770,000	710	67	17
1958	2,606,000	1,308	95	35
1957	2,779,000	1,849	115	39
1956	2,458,000	1,452	104	34
1955	2,159,000	1,178	102	34
1954	1,896,000	830	103	—
1953	1,766,000	945	110	—
1952	1,905,000	1,322	100	—
1951	1,705,000	1,305	96	—
1950	1,498,000	663	80	—

*Source: VOSA summary.

Overall, the Barinas area had the most intensive exploration work during the past two to three years, especially seismic exploration. Much drilling was done there, all of it disappointing; and several companies released large explorations areas. In Lake Maracaibo, activity began with a concerted boom when the first concessionaires hit production almost immediately. Subsequent work was by way of expansion drilling rather than exploration. Few of the new concessionaires were disappointed; Superior drilled one dry hole, but a single duster can hardly delineate the field.

Exploratory results were good in the Gulf of Paria; after four dry holes, a stepout by Paria Operations Inc., a four-company combine, was completed with good results, and the company is going ahead with its program. Increased activity is underway by Pan American International, which has spudded its initial offshore wildcat in Venezuela's section of the Gulf of Paria. The 12,000-ft test is in the southeast corner of Pan Am's 22,356-acre Block 7, at

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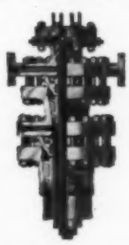

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TYPES "DX" AND "LDX" ROTARY SOCKETS

The Type "DX" is designed for gripping the outside of pipe and other cylindrical objects to be fished from a well. Easily adapted to catch pipe, pipe upset, tool joint or coupling. The Type "LDX" differs from the "DX" in that an additional pull-down of the slips has been incorporated which permits catching a fish with a range or a pull-down of half an inch.

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BAASH ROSS JOY

VENEZUELA—Government Income Vs. Oil Revenues, 1950-1960
(Millions of Bolivares)

Year	Total Income	Oil Income	% Oil
1950	1,917	1,019	53.2
1951	2,267	1,411	62.2
1952	2,408	1,508	62.6
1953	2,534	1,549	61.1
1954	2,632	1,520	57.8
1955	2,992	1,714	57.3
1956	4,375	3,036[a]	69.4
1957	5,397	3,822[a]	70.8
1958	4,685	2,667	56.9
1959*	5,400	3,228	59.8
1960*	5,200	3,000	57.8

[a]Includes income from new concession grants.
*1959 income estimated by Economics Ministry; 1960 by Oil Ministry.
Source: Ministry of Mines and Hydrocarbons.

VENEZUELA—Crude-Oil Production, by Company
(Thousands of Barrels Per Day)

Company	1956	1957	1958	1959
Creole	1,083.7	1,148.5	1,071.1	1,098.2
Shell	710.3	873.9	703.7	817.4
Mene Grande	364.7	404.1	388.9	376.8
Mobil	97.1	115.7	127.6	112.6
Petmer	24.1	28.4	34.1	30.7
Richmond	61.7	92.0	75.2	55.7
Texas	47.1	45.3	50.9	55.9
Varco	20.1	24.9	27.9	27.1
Sinclair	29.1	29.4	61.5	46.4
Phillips	11.1	14.0	11.6	28.7
Pantepec	4.9	—	—	—
Talon	2.7	2.2	1.6	1.3
Caracas	0.1	—	—	—
Coro	0.1	0.2	—	—
Superior	—	0.7	26.3	14.8
Ven-Sun	—	—	12.1	42.7
San Jacinto	—	—	9.7	35.2
Signal	—	—	3.3	22.6
Pan Venez.	—	—	—	—
Continental	—	—	—	—
Total	2,456.8	2,779.3	2,604.5	2,771.0

Source: Ministry of Mines and Hydrocarbons.

VENEZUELA—Oil Statistics, 1955-1959
(Thousands of Barrels Per Day)

	1955	1956	1957	1958	1959 (Jan.-Sept.)
PRODUCTION:					
Total	2,160	2,460	2,782	2,608	2,760
Crude	2,157	2,457	2,779	2,605	2,757
Natural gasoline	3	3	3	3	3
REFINING	537	624	688	732	809
INTERNAL CONSUMPTION OF PRODUCTS:					
Total	107	124	141	132	135
Industrial and domestic use	54	59	66	69	75
Oil-industry use	13	14	14	11	11
Bunkers	40	51	61	52	49
EXPORTS:					
Total	2,024	2,312	2,576	2,437	2,539
Crude petroleum	1,619	1,845	2,079	1,884	1,976
Products	405	467	497	553	563

Source: Ministry of Mines and Hydrocarbons.

latitude 10° 22′ north, longitude 62° west, a few miles southwest of an oil find made earlier in 1959 in Trinidad's waters by Standard of California.

One of the brighter spots in exploration was the discovery in eastern Venezuela of a major extension of the Aguasay field by Sinclair Venezuelan Oil Co. A successful dual-zone wildcat, known as East Aguasay No. 2, was completed in two zones: one at 14,183 ft; the other at 14,264 ft—for a total of 1,352 b/d of about 30-gravity crude oil. The new producer is three miles east of Aguasay No. 1, Sinclair's discovery well, which is eight miles east of the established Aguasay field. The new well proves, in the company's opinion, a major continuation of the producing trend, which now extends over 10 miles of Sinclair concessions. The reserves of the 100-square-mile region are already estimated at between 100 million and 300 million barrels, and over 60 wells have been completed since the initial discovery in 1957. Since Sinclair already has 20,000 b/d shut in in all of Venezuela, the new area will be kept as a reserve.

At mid-1959 Venezuelan Sun again extended its Lake Maracaibo discovery, with completion of its 30th producing well a considerable distance to the south in Block No. 1 oil concession. The concession is held by Venezuelan Sun Oil Co., Venezuelan Atlantic Refining Co., and Texaco-Seaboard Inc. Venezuelan Sun operates the concession for the group. The new well, SVSX-32, was completed as a dual producer, testing over 8,200 b/d of oil from two zones of the prolific Eocene sands from depths between 8,750 ft and 9,400 ft. It flowed 4,380 b/d from the upper zone, and 3,820 b/d from the lower zone, both through 5/8-in. chokes. Venezuelan Sun first discovered oil on Block No. 1 in mid-1957. Since then, no dry holes have been drilled.

Phillips has completed a number of producing wells, drilling on Block 17 as operator of the block for a group composed of itself and Sunray Mid-Continent Oil Co., Ashland Oil and Refining Co., Western Natural Gas Co., El Paso Natural Gas Products Co., Kerr-McGee Oil Industries Inc., and Venezuelan Pacific Petroleums Ltd. A large oil well flowed 7,008 b/d of 35-gravity crude per day at a location 3,500 ft from a previous discovery on Lot 17 in Lake Maracaibo. This new well was completed from a very thick section of Eocene pay. The discovery well, which flowed 6,600 b/d, was completed in December 1958.

A well flowing 6,640 b/d was completed in Lake Maracaibo during 1959 by Signal Oil & Gas of Venezuela. The new development well, Centro No. 16, produced 26-gravity clean oil from the Eocene on a two-hour test. Signal's three rigs on the 28,000-acre concession currently are drilling two development wells and one exploratory well.

Superior Oil Co., which has about 100,000 b/d of productive potential (all shut in because of USA import restrictions), failed during 1959 to find commercial production in what was then Lake Maracaibo's deepest test. The company had hoped to establish the lake's first production from the Cretaceous basement limestone. The wildcat, Agua 139-1, was drilled to 16,402 ft on Creole's 3,700-acre concession in the northwestern part of the lake. Superior holds a farmout on formations below the Eocene. The test found water-free oil, but not in commercial quantities.

North of "La Freitera" field, Mobil Oil completed, as a two-zone producer, the exploratory well Maulpa-1 during mid-year. On initial test, the well produced 1,176 b/d through two 5/16-in. chokes, with an average gas-oil ratio of 3,320 cu ft per bbl and an average gravity of 42.8 API.

After years of discouragement, a well in Lake Maracaibo may give Indiana Standard its first worthwhile production. The well, SLG-123X on Block 12, in the central part of the lake, flowed a reported 6,000 b/d from sands in two zones, believed to be of the "B" group Eocene. A 90-ft section of upper sands, from 9,870 ft to 9,960 ft, flowed 37-gravity crude. A 70-ft section of lower sands, from 9,980 ft to 10,150 ft, yielded 32-gravity oil. Each interval tested about 3,000 b/d.

In the south, and along the Colombian border, Mene Grande Oil Co. has given up four "obligatory" Colombian border concessions, for which it paid $1.9 million in bonuses in 1956. No wells were drilled on the tracts totaling 98,840 acres in Apure state. Shell has given up about one-third of its acreage in eastern Venezuela.

Creole Petroleum is turning back its Block 5 concession in northern Monagas state after having drilled 11 dry holes, ranging up to 13,000 ft in depth. Creole paid $15.2 million bonus in 1957 for the 74,000-acre block. San Jacinto has renounced a 24,000-acre concession.

Paria Operations group (Continental, Texaco, Ohio Oil, Cities Service, Richfield) surrendered acreage on the Colombian border which it had been obligated to take in 1957 along with its new Gulf of Paria concessions.

In southern and eastern Venezuela, especially in the Barinas area, results were discouraging during 1959 to say the least. Twenty-four wildcats were drilled so far; all were dry. Most of the companies have given up, including King-Mill Oil Co., formed by USA textile interests, which drilled two very expensive dry holes. No wildcatting is now under way.

To date, the only oil found in Barinas is in the small fields discovered by Sinclair and Socony between 1945 and 1957. Production averaged about 58,000 b/d in 1958, the first full year of exports through the new 100,000 b/d pipeline to the Caribbean; production now is somewhat lower.

Natural Gas: Venezuela's gas is found in three principal areas, usually associated with oil. Gas operations have so far been primarily concerned with conservation and reservoir uses which aid and increase the recovery of crude oil. While there are a few gas-transmission pipelines and gasoline plants in operation, most of the utilized gas is returned to the reservoirs.

Present Venezuelan reserves amount to 32.4 trillion cubic feet of gas and over 16 billion barrels of crude oil. They result in a ratio of gas reserves to oil reserves of 2,000 cu ft per bbl. Comparable figures for the United States are 254 trillion cubic feet of gas, with 30 billion barrels of crude oil. Canada has 23 trillion cubic feet of gas reserves, and 3.7 billion barrels of oil, giving a gas-to-oil reserve ratio of 6,000 cu ft per bbl.

During 1958, gas utilization reached 44% of a total production of more than three billion

(Continued on page 120)

VENEZUELA—Oil Activity, 1955-1959

	Exploration Field Parties					Concessions (Million Hectares)	Wells Drilled	Reserves		Reserves Added Per Barrel of Oil Produced
Year	Seismic	Gravity	Surface	Core-Hole	Geochem.			Oil (Billion bbl)	Gas (Trillion ft)	
1955	192	34	127	16	—	5.87	1,290	12.43	23.30	1.9
1956	148	29	121	35	1	6.17	1,601	13.99	26.95	—
1957	261	45	108	41	5	6.69	1,824	15.59	29.02	—
1958	207	52	103	47	—	6.35	1,960	16.78	33.35	1.2
1959*	60*	20*	65*	33*	—	6.08*	710	17.45†	35.68†	—

*9 months only. †Estimating.

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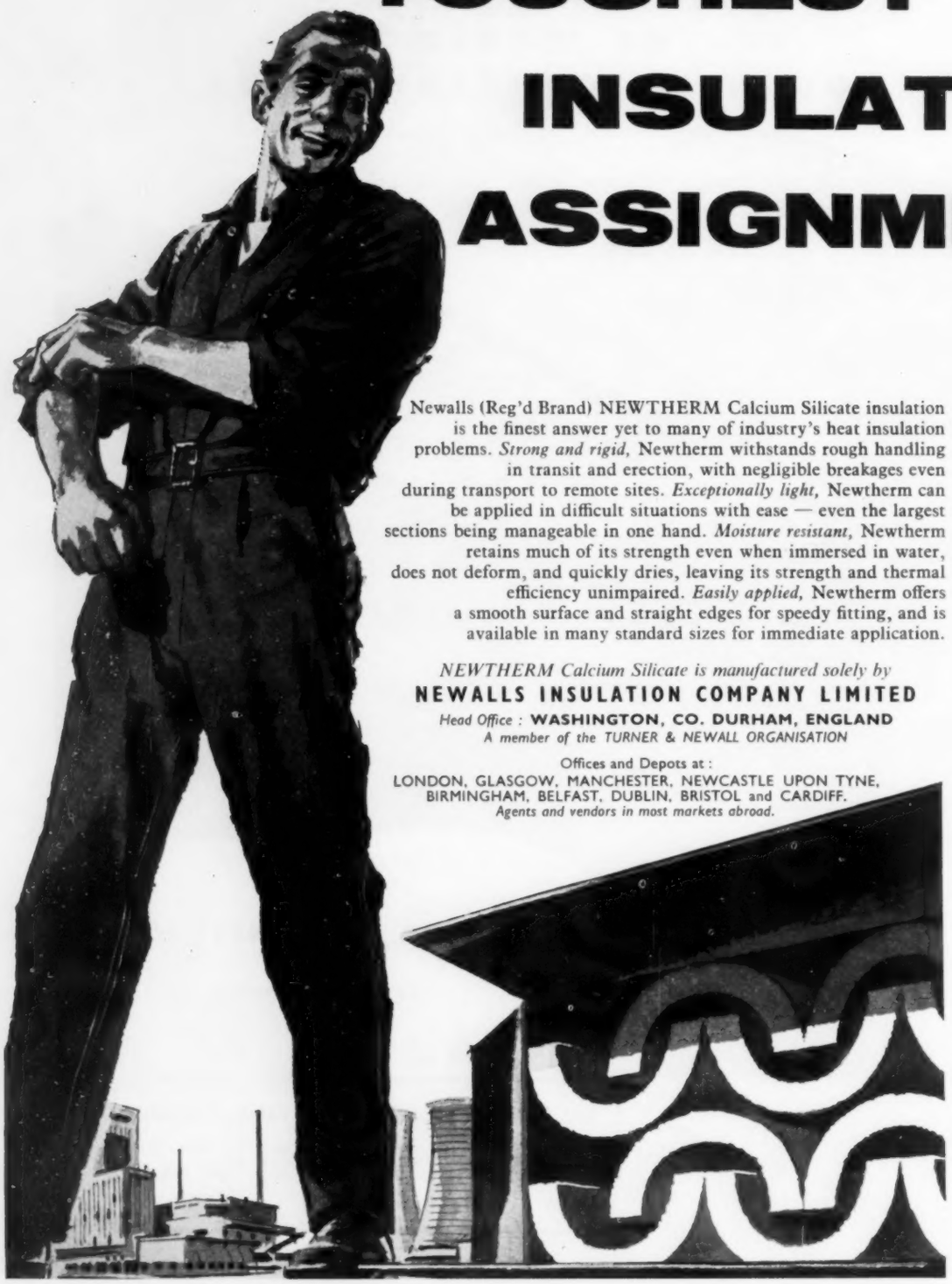

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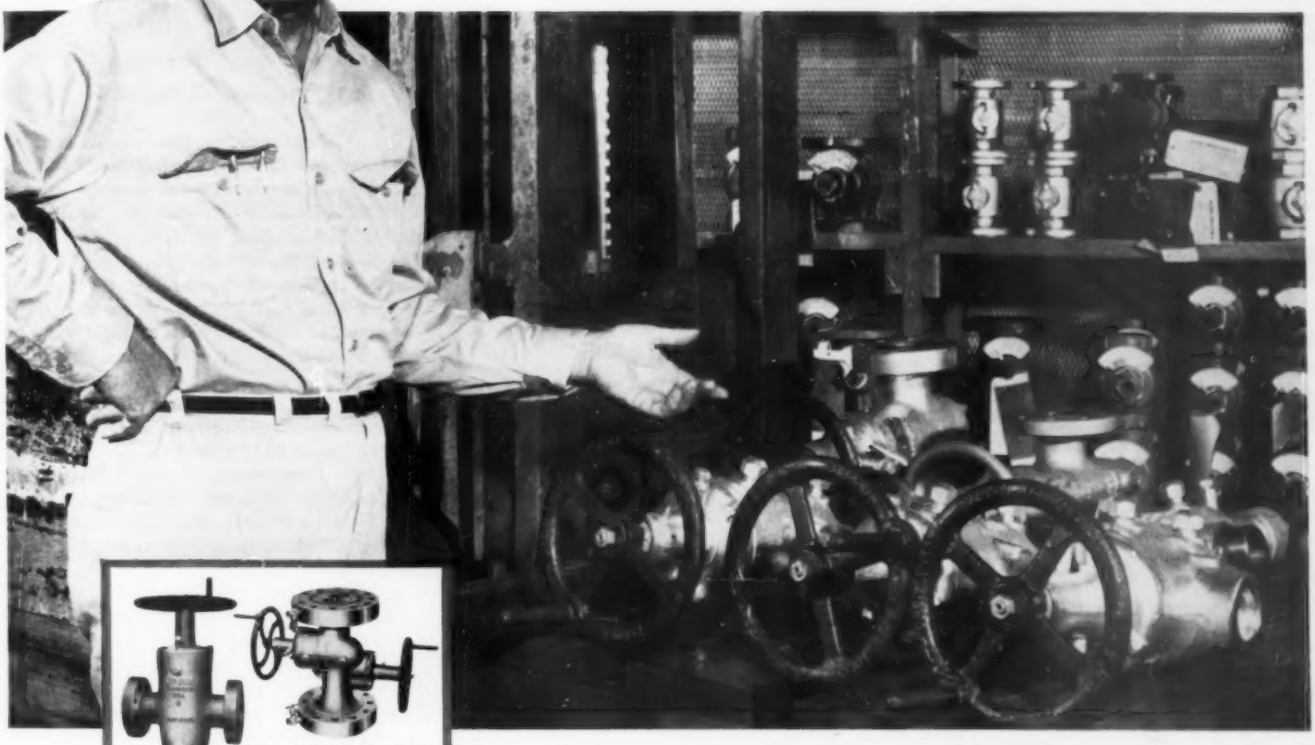

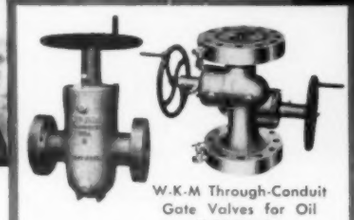

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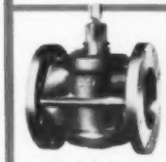

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VENEZUELA—Refining Capacity
(Barrels Per Day)

Company	Crude Capacity	Cracking Capacity
Cia. Shell de Venezuela, Ltd.	[1]283,000	35,000 FC
Cafdon		8,700 T
San Lorenzo	45,000	
Colon Development Co. Ltd.		
Calvario	300	
Casigua	1,000	
La Riviera	300	
Creole Petroleum Corp.		
Amuay	345,500	11,100 Fhy
Caripito	68,000	36,000 Vis.
Petroquimica, Moron	3,000	350 C
Phillips Petroleum Co., San Roque	3,500	
Richmond Expl. Co., Bajo Grande	[2]30,000	
Sinclair Oil & Ref. Co., Puerto La Cruz	35,000	12,000 Vis.
Mobil Oil Co. de Venezuela		
El Pailto	[3]	
Barinas	200	
Texas Petroleum Co., Tucupita	10,000	
Venezuela Gulf Ref. Co.,		
Puerto La Cruz	[4]61,200	14,500 Vis.
		12,000 Plf
		8,650 FC
TOTAL	886,000	138,300

[1] Adding 45,000-bbl visbreaker. [2] Adding 5,000-bbl daily crude capacity. [3] 50,000-bbl refinery near completion to include 6,000-bbl cat-reformer. [4] Adding 65,000-bbl crude capacity. C—catalytic. T—thermal. F—fluid. Plf—Platform.

cubic feet per day, which may be broken down as follows:

Usage	%	*Millions of Cubic Feet Per Day*
Fuel and shrinkage	10	310
Sales	4	120
Injection	30	900
Total	44	1,300

Reserves: According to the government's figures, Venezuela's proved crude-oil reserves rose 10.2% to 17.2 billion barrels as of January 1, 1959. The net increase for the year was 1,585,000,000 bbl. The ratio of annual production to reserves was 5.5%.

TRANSPORTATION: Little capacity was added to Venezuela's crude pipeline capacity during 1959. A 34-mile, 8-in. crude line from El Rosario to Calvario was built for Colon Oil Co. (Colon was absorbed at the end of the year into Cia. Shell de Venezuela). Sun Oil Co. built an 18-in. 100,000 b/d pipeline from its Block 1 in Lake Maracaibo to Punta de Palmas terminal. Superior Oil Co. postponed building its new crude-oil line in Lake Maracaibo, and shut in all wells there for lack of a crude outlet.

The Lake Maracaibo channel for oil tankers by 1963 will be deepened to 49 ft from the present 33½ ft, according to the Ministry of Mines and Hydrocarbons. About 900,000 b/d of crude and products were shipped out of the lake in 1958 through the 19-mile channel, opened in 1956. Tankers pay a toll of 3 cents per barrel of cargo.

Cia. Shell de Venezuela is spending $100 million on a program in Lake Maracaibo for an automatic crude-gathering and terminal system. Known as North Terminal System, the facilities will handle most of Shell's 700,000 b/d to 900,000 b/d output in the region.

The government's Petrochemical Institute inaugurated the 200-mile Anaco-Caracas gas line as the first link in a 1000-mile network intended to furnish gas to domestic and industrial users in Western and Central Venezuela.

VENEZUELA—Crude-Oil Production
(Millions of Barrels)

Company	1956	1957	1958	1959	% of Change 1958-1959
Creole	1,083.7	1,148.4	1,071.1	1,108.8	4.4
Shell	690.2	851.6	681.4	802.3	19.6
Meneg	364.7	404.1	388.9	365.6	6.0
Mobil	97.1	115.7	127.6	112.4	11.6
Richmond	61.7	92.0	75.2	50.7	34.1
Sinclair	29.1	29.4	61.5	46.2	25.6
Texas	47.1	45.2	50.9	55.6	9.2
Petmer	24.1	28.4	34.0	31.8	6.7
Varco	20.1	24.9	27.9	25.8	8.2
Colon	20.1	22.3	22.2	19.9	10.8
Superior	—	0.7	26.3	16.1	35.6
Phillips	11.1	14.0	11.6	26.9	130.0
Ven-Sun	—	0.1	12.1	40.9	289.5
San Jacinton	—	—	8.7	33.7	337.7
Talon	2.7	2.2	1.5	1.3	18.8
Signal	—	—	3.2	24.5	1,066.7
Continental	—	—	0.1	—	100.0
Coro	0.1	0.2	0.1	—	100.0
Pan Venez.	—	—	0.1	—	100.0
Caracas	0.1	0.1	0.1	—	—
Pantepec	4.9	—	—	—	—
TOTAL	2,456.8	2,779.3	2,604.5	2,762.5	7.0

REFINING: Capacity at the Vengref refinery in Eastern Venezuela will be doubled to 120,000 b/d by 1961. Creole, Richmond, and Shell refineries in the West also increased their capacities. Mobil Oil Co. de Venezuela is building a new refinery at El Palityo, which will add about 50,000 b/d capacity to the country's total capacity this year.

OIL LAWS

During 1959 the oil law of Venezuela, along with its 1955 amendments, was published in English Translation in an unusual collection entitled *"South America—Basic Oil Laws and Concession Contracts."* The oil laws of the rest of South America are included as well, along with the recent contracts concluded in Argentina between YPF and private companies and concession agreements in other countries. The original volumes are kept up to date by issuance of revisions containing new laws passed or contracts concluded during the year. For further information concerning this highly recommended publication, please address inquiries to the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

During 1959 no basic changes occurred in the oil regulations of Venezuela. The proposed new regulations, which had been introduced at the last of 1958 and which were to come into effect shortly thereafter, have been shelved.

During 1959 the government obtained the services of a conservation specialist in the United States, and announced its intention of regulating production. However, the refusal of Washington to give Venezuela a guaranteed country-of-origin oil-import quota halted the plans.

NATIONAL FACTORS

Government income from oil dropped 15.3% in 1959, despite the 1958 income-tax hike, according to Dr. Humberto Penaloza, director of economics for the Ministry of Mines. He attributes the drop largely to a decline in income-tax payments, with returns from royalties and other taxes down comparatively little. The industry's 1959 income-tax payments will be about $337.2 million, about the same as in 1957, before the tax law was rewritten. The balance of the $781.5 million the government looks for from the industry will come from $384.3 million in royalties, and $60 million from other taxes. The government's share has worked out in practice:

VENEZUELA*—Exports of Crude and Products
(Thousands of Barrels Per Day)

	Crude Petroleum	Products	Total
1955	.911	1.157	2.068
1956	1.113	1.263	2.376
1957	1.366	1.189	2.555
1958	1.243	1.173	2.416
1959 (Jan. through Sept.)	1.297	1.198	2.495

*Including exports from Aruba and Curacao.
Source: Ministry of Mines and Hydrocarbons.

VENEZUELA—Estimated Future Oil Production
(Thousands of Barrels)

Year	Daily Production	% Change Over Previous Year
1958	2,604.8	—6.3
1959	2,770.6	6.4
1960	2,887.5	4.5
1961	3,011.2	4.0
1962	3,131.6	4.0
1963	3,256.9	4.0
1964	3,377.9	4.0
1965	3,522.7	4.0

Source: Ministry of Mines and Hydrocarbons.

in 1958 to about 66-34, and in 1959 about 68-32.

Capital spending has dropped each year since the peak in 1957, when payments for new concessions increased total company investments to $889.5 million. In 1958, the figure dropped to $536.4 million; in 1959, it was about $335.1 million.

The industry's net return on total investment dropped to 12.8% in 1959, based on the first nine months' figures. This is a drop from a net profit of 16.8% in 1958, and from a high of 29.5% in 1957.

Estimates for 1959 made by Dr. Penaloza show net oil-industry income, after income taxes, will be about $377.4 million, down from $484 million. Government income from oil operations will slip to about $781.5 million, down from $922.8 million. Capital spending will show a drop to $335.1 million, down from $536.4 million. An estimated 600 wells, or fewer, were completed in 1959—less than half the 1958 total, and one-third the 1957 completions. Refining was up, with 806,000 bbl daily processed during the first nine months, against 732,000 bbl daily in 1958.

President Betancourt has set April 19, 1960, as the date for formation of the new National Oil Company, which is to be formed by the government to develop known productive areas. It is indicative of the deteriorating relations between the government and the companies. Partly this is due to communist influence, which is reportedly very strong. It has led, among other things, to a move to prevent non-Venezuelan lawyers from practicing in Venezuela and to recent attempts to bar engineers who do not have Venezuelan degrees.

Labor demands have been particularly strong, including a recent stipulation that all foreign labor should gradually fade out over a two- to three-year period up to the level of directors, and be replaced with Venezuelans.

The government has reversed its earlier proposal to take on the social services now assumed by the oil companies. The oil labor negotiations continue—with all 165 demands in the labor unions' contract (including 96 social-service clauses) back on the bargaining table. Altogether, these demands would add an estimated $1.2 billion to oil companies labor costs.

Close on the heels of the 60% tax in late 1958 came the news that the government wishes to restrict oil production in coming years in the hopes the country will became gradually less dependent on oil and will develop other industries.

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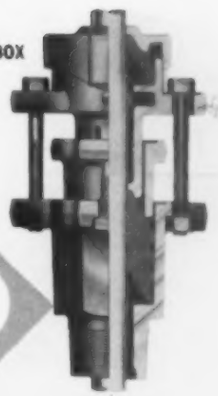

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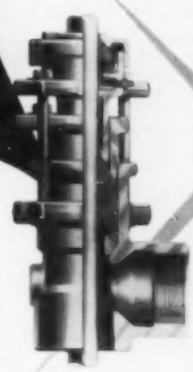

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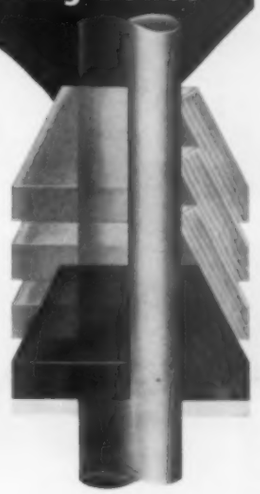

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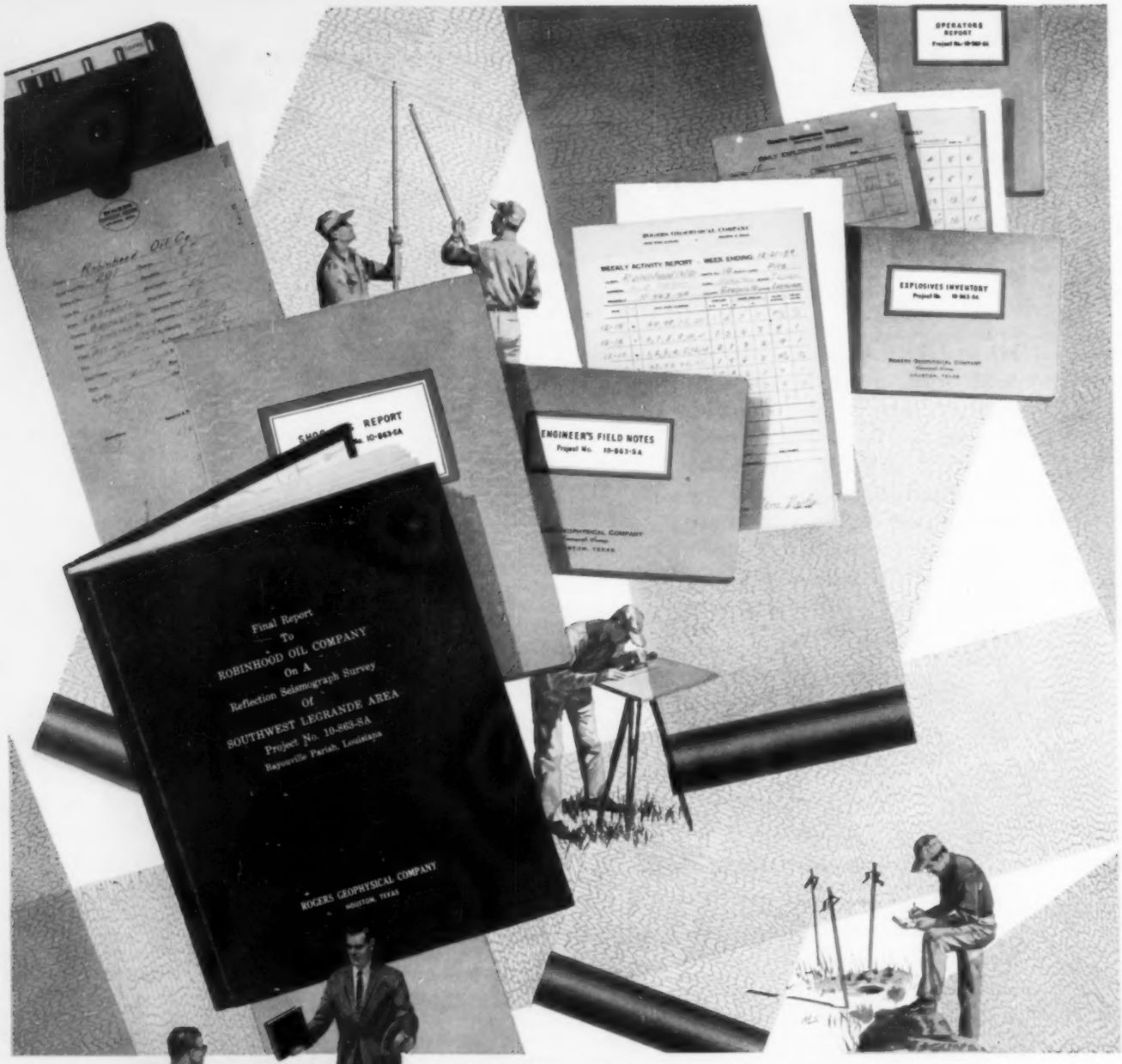

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ANGOLA

EXPLORATION: For a review of the history of exploration and a concession map, see **World Petroleum Report** *1959*, p. 121. During 1959 PETRANGOL, affiliate of Petrofina, continued exploration and drilled several wells. The principal recent find has been at Cacuaco 2 in the Cuvo-Calucala formation, which produced about 200 b/d of 23 API gravity crude through a ¼-in. choke from 8,140 ft to 8,190 ft during late 1958. A second possible pay was being investigated at about 8,000 ft in the Eocene marls at the end of the year. Two other wells in 1958, Zango 4 and Longa 1, were dry.

A new oil field was reported, in May 1959, at Galinda in Quissama district of Angola, by PETRANGOL. According to a company spokesman, commercial production was expected in 1959.

ANGOLA—Crude-Oil Production by Fields
(Barrels)

Field	Company	Discovery Date	Total Wells Drilled	Producing Formation	Production 1958
Benfica	Pétrangol	4-13-55	12	Aptian ls.	187,102
Luanda	Pétrangol	7- 1-57	14	Albian ls.	144,823
Cacuaco	Pétrangol	7-30-58	3	Basal ss.	28,173

Gulf Oil Corp. is exploring Cabinda, an exclave of Angola. The first well, Ponta Vermelha 1, was abandoned about 10 miles south of the town of Cabinda at 8,428 ft. A second well, Bucomazi 1, was at 9,000 ft during early 1959. No results have been reported.

PRODUCTION: During 1959 production averaged slightly over 1,000 b/d, compared with a total of 360,118 bbl in 1958. Gas production in 1958 totaled 85,731,789 cu ft.

OIL LAWS

During 1959 a publication of unusual scope was published for the first time containing the oil laws of Angola (and of Portugal) in English translation, as well as the laws of the remainder of South and Central Africa. It is a word-for-word translation which is kept current by supplements. The publication is entitled *"South and Central Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* It is available from the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be sent to that address.

No changes have occurred in Angola's oil laws as contained in *World Petroleum Report—1959*, p. 121.

NATIONAL FACTORS

No changes have occurred in Angola's factors affecting investment favorability as contained in *World Petroleum Report—1959*, p. 122.

BELGIAN CONGO

EXPLORATION: Work is under way by Petrofina for the Syndicat d'Études Geologique et Minière de la Cuvette Congolaise (see map in *World Petroleum Report 1959*, p. 122). No Exploration was conducted by Petrofina in 1959.

Oil exploration in the Bas-Congo has been started by Syndicat pour la Réchèrche de Pétrole dans le Bas-Congo. The company was formed in July 1959, with initial capital of 150 million francs (about $3 million), and it has a concession of 400,000 hectares (about 988,440 acres). The company is taking preliminary soundings in the Mayumbe.

PORDUCTION, REFINING, MARKETING. There is no production nor refining. Marketing needs are considerable, and expanding rapidly. All are imported.

OIL LAWS

During 1959 the oil laws of the Belgian Congo appeared in English translation in an unusual new publication which came out late in the year. It is *"South and Central Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* Information is available from the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be sent direct to that address. The publication contains oil laws of the rest of Africa (excluding North Africa, which are contained in separate volumes) and keeps them up to date by supplements.

During July 1959 a new oil law came into effect. It stipulates only general terms for new concessions, leaving all new contracts to be approved by the parliament. It appears very favorable to international investment, however.

NATIONAL FACTORS

For a review of national factors see *WPR 1959*, p. 122.

ERITREA

There has been no recent exploration activity, but the Italian government still retains exploration rights (see map) which it obtained in this former Italian colony before World War II.

The first oil shows in Eritrea were discovered in 1868 along the west coast of the peninsula of Buri by an Italian explorer, Carlo Piaggio. Subsequent indications were found in the sea, between the little island of Bulissar and the Scioc Point of the Great Dahlak (Dahlak Kebir).

Two holes were drilled: The first, by Prof. Bibolini on Bulissar Island, reached 612 ft; the second, just a few miles north of Massawa by Prof. Vinassa de Regny, reached 621 ft in 1933.

In 1935 the Italian government charged Azienda Generale Italiana Petroli (AGIP) with oil exploration in Eritrea. Exploration was concentrated on the Great Dahlak, the largest of the numerous islands of the Dahlak group, because oil seeps were reported near its waters. Under the direction of Ing. Zanmatti (now general manager and director of AGIP Mineraria), a shallow well was drilled to 456 ft. Under a maderporic blanket was found a calcareous struture and subsequent clay.

After this drilling and the geological survey, AGIP decided to concentrate mostly on the Great Dahlak, specially along the little bay called Gubert Mus Neft. Aerophotogrammetric and gravimetric surveys of the islands were completed, and in 1937 a light rig started the Suri 1 well. Drilling operations were halted waiting for a heavy drilling rig, when in 1940 the activities were interrupted by the war.

FRENCH EQUATORIAL AFRICA

Oil activities are covered under Gabon, French Cameroons, and Middle Congo sections of this volume.

OIL LAWS

There is separate oil regulation for French Equatorial Africa. Controlling statutes are as follows: Decree 54-111 of November 13, 1954; Decree 55-638 of May 20, 1955; Decree 57-242 of February 24, 1957; Decree 57-859 of July 30, 1957. Local regulation for same is contained in Déliberation 92-58-1553 by the Grand Council of November 12, 1958, and made effective by Arrête No. 2,777/M of November 19, 1958.

During 1959 all these laws were translated and published in *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* an unusual and valuable new source. The same publication contains the principal laws of all other countries in the Central and South Africa region. It is available from the publisher: *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

FR. CAMEROONS

EXPLORATION: Only one company, the Ste. de Réchèrches et d'Exploitation des Pétroles du Cameroun (SEREPCA), is exploring. It has a 10-year permit, granted in 1952, on some 3,475 square miles centered at Douala on the Atlantic coast. Several gas wells have been completed in past years, but no oil discoveries have been made.

The Cameroon basin is shallow along its northern part (0 ft to 6,500 ft), but deepens southwest over a distance of 20 to 25 miles to the deepest part (13,000 ft to 16,000 ft) in the vicinity of Douala. A basal sandstone unit (probably Cenomanian) has been found to have a thickness of as much as 1,100 ft in some wells. These sands are covered by a thick dominantly shaly section of Turonian, Senonian, and Tertiary beds in which reservoir rocks are scarce.

During 1957, production tests were made on different wells of the Logbaba area—proving gas reserves of 14 billion cubic feet.

SEREPCA will offer a 50% interest to an American associate which has experience in stratigraphic fields and which is well equipped technically and financially. SEREPCA is likely to ask the USA firm to take into account its past investment in Cameroon exploration.

OIL LAWS

During 1959 a new publication appeared containing the oil laws of the French Cameroons in word-for-word translation. It is an exceptionally useful series of documents which include all the other countries of Central and South Africa; other volumes cover the rest of the continent. The volume is entitled *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* For information regarding it, inquiries should be addressed to the publisher: *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

FRENCH CAMEROONS—Exploratory Wells Drilled in 1959 (By SEREPCA)

Well	KW 1
Location	Kwa-Kwa
Result	Gas showings
Final depth (feet)	5,764

Concession terms of SEREPCA are favorable. The royalty is a flat 3%, but production up to 20,000 b/d during the first four years is exempt; the profit tax is 12%, from which royalty payments are deductible; there is a guarantee of a 75-year development concession when a field is discovered; and exploration material and equipment may be imported duty-free.

A French law applicable to the territory provides for percentage depletion on the same basis as in metropolitan France—either 27.5% of gross sales or 50% of net taxable profits. This sum must be reinvested in oil exploration within five years—in the Cameroons or elsewhere in French territory.

SEREPCA has an automatically renewable 10-year convention, signed in 1951, with the local government. When the Cameroons become independent in 1960, the territorial government may want to renegotiate its convention, but no drastic changes are expected. SEREPCA feels that the favorable terms of the convention are a fair counterbalance to the difficulties in Cameroon exploration.

The local government holds a 10% share in SEREPCA. Other owners are the French government's Bureau de Réchèrches de Pétroles, 54%; Caisse Centrale de Cooperation Economique, a State overseas investment fund, about 19.7%; FINAREP, 10%; and COFIREP, 5%.

ETHIOPIA

EXPLORATION: Until recently there were no oil concessions, following Sinclair's surrender of acreage in 1957. For a map of Sinclair's acreage and wells, see *WPR 1959*, p. 122. During 1959, however, an exploration concession was obtained by Gewerkschaft Elwerath, a German concern in which Esso and Shell have minor holdings. The concession covers the Ogaden province, formerly held by Sinclair.

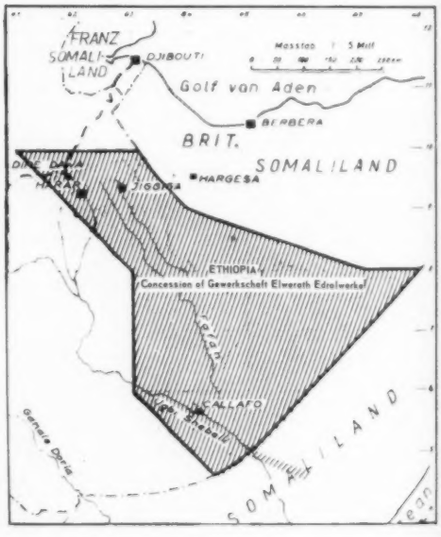
According to press reports, the Yugoslavian company, Naftaplin, has also received an exploration concession, but this has not been confirmed.

PRODUCTION, REFINING, MARKETING: There is no production nor refining. Consumption is entirely imported.

OIL LAWS

During 1959 the concession contract of Sinclair Oil Corp. over Ethiopia, now lapsed, was published in *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* This new publication is unusual in that it contains all the oil laws and concession contracts of Central and South Africa and keeps them up to date by supplements to the original volumes. It is available through its publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* Requests for further information on it should be sent directly to that address. It is highly recommended as the only source for this type of information.

Since there is no petroleum law, concession contracts are negotiated directly with the government, and the new Gewerkschaft Elwerath concession reportedly is unusual in that it has no royalty and no surface taxes. Profits are taxed on a sliding scale, starting at 50% on production up to two million tons yearly (about 40,000 b/d) and rising 1% for each one million tons additional up to 60% tax at 250,000 b/d production. This novel arrangement has not been confirmed, since the concession has not been published.



FRENCH SOMALILAND

No exploration was reported during 1959. There is no production nor refining. All oil needs are imported. Estimated oil-product imports into French Somaliland during 1958 came to 4,480,000 Imperial gallons. The bulk of it was reexported to Ethiopia and to vessels calling at Djibouti. The imports, by product, were in Imperial gallons): gasoline, 700,000; kerosine, 220,000; diesel fuel, 1,760,000; aviation gasoline, 200,000; bunker fuel, 600,000; total, 4,480,000.

GABON

EXPLORATION: Since 1956, five oil fields have been found by the Ste. des Pétroles d'Afrique Equatoriale Française (SPAEF).

There is a total of nine rigs drilling in Gabon. Two other rigs are at work in the Middle Congo, completing the rig total for French Equatorial Africa. Of this number, five rigs are owned by SPAEF and six rigs are those of three contractors.

SPAEF has concluded an agreement whereby Mobil Oil Française and Mobil Exploration West Africa Inc. will operate jointly in exploration and exploitation within an area of some 25,000 square kilometers which are included in the SPAEF permit. According to the terms of the agreement—recently submitted to the local authorities of the territories—the expenses and receipts will be shared between them in the proportion of 50% for SPAEF, and 25% each for the other two partners.

Also, an agreement was signed associating the Royal Dutch/Shell and SPAEF in equal partnership for the exploration and exploitation of a total 4,000 square kilometers included in this same permit.

The two affiliates, Mobil International Oil Co. and SPAEF, made an oil discovery in Gabon late in 1959. The well, Rembo Kotto No. 1, produced 28 bbl of light-gravity oil from a depth of about 2,000 ft during a two-hour drill-stem test. The indicated daily rate is 340 bbl. Under the agreement with SPAEF, Mobil affiliates have a 50% interest in the well. The Mobil affiliates have scheduled expenditures of $45 million (with a minimum of $22.5 million) during the six-year agreement period which covers 6,175,000 acres in the Gabon and Congo republics.

PRODUCTION: Production in 1958 averaged 9,700 b/d. During 1959 production averaged 14,600 b/d, and is estimated to rise to about 18,500 b/d in 1960. The 1960 figure includes the production of the Pointe-Indiènne field in the Congo, which will produce about 2,100 b/d initially. The first tanker loading is due in July 1960.

Fields are Ozouri, Pointe-Clairette, M'Bega, Animba, Cape Lopez, and Pointe-Indiènne.

Ozouri field, discovered in January 1956, is located in the southern part of Mandji Island. Seventeen wells resulted in 11 producers, and six outside the reservoir. This is a salt dome, varying between 2,030 ft and 2,253 ft at water-oil contact level at well No. Oz. 10. It is made up of silicified marls resembling formations in California. Production per well is between 220 b/d and 860 b/d. Crude is heavy (about 20 API gravity), with high viscosity, similar to Lagunillas.

The Pointe-Clairette-Port Gentil field was discovered in July 1956. Forty-nine wells have been drilled—39 of them producers. Two rigs are working. Four different pay levels were found in this field: two formations of silicified marls (Eocene); the Senonian sands (lenticular-shaped) between 3,600 ft and 5,850 ft; and Senonian dolomite silts between 4,400 ft and 4,700 ft. Production per well varies between 310 b/d and 560 b/d. The crude is mixed-base, with a paraffinic tendency. Gravity is 32 API. When refined, it yields a good percentage of gasoline, kerosine, and fuel oil. Because of the low sulfur content, fuel-oil quality is good.

M'Bega was discovered in August 1957. Limits of the reservoir are not as yet known; two rigs are being used. Thirty wells have been drilled there—19 of them producing. Two levels of reservoir traps of silicified marls were found—the first between 2,500 ft and 3,680 ft, and the second between 2,860 ft and 3,760 ft at their extreme points. Wells are producing from 190 b/d to 1,250 b/d. Gravity is 27 API.

Animba field is small. Out of 13 wells, only four were producers. The pay zone is in silicified marls and dolomites between 1,665 ft and 1,857 ft. Gravity is 13 API. Extraction by pumping is possible only after injection of crude from the neighboring field of M'Bega, which is lighter.

At Cape Lopez, four wells were drilled, and all found oil. One rig is being used.

At Alewana, four wells were drilled. Only one is producing.

Two wells out of the four drilled at Tchengué structure found natural gas.

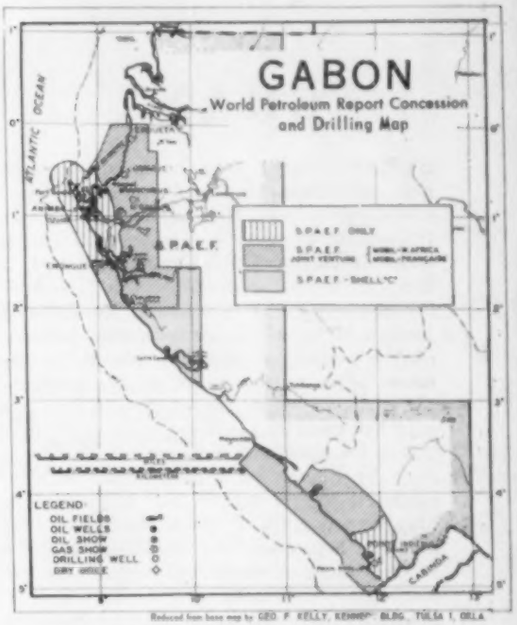
Reserves: SPAEF estimates reserves at about 37.5 million barrels.

REFINING: There is no refinery at present, although a 20,000 b/d plant is being considered.

TRANSPORTATION: A 30-mile pipeline connects Cape Lopez and Ozouri-M'Bega. A 10-mile 8-in. line runs from marine storage to Pointe-Clairette.

GABON—SPAEF Exploratory Wells Drilled in 1959

Wells	Location	Result	Final Depth (Feet)
LW 1	Lac Wezé	Dry hole	8,309
AZ 1	Azilé	Dry hole	5,874
AZ 2	"	"	8,200
BL 4	M'Bilapé	Dry hole	6,484
BL 5	"	"	5,889
BL 6	"	"	5,744
IG 2	Igoguino	Dry hole	4,920
IG 3	"	"	5,084
IG 4	"	"	2,053
IG 5	"	"	2,000
IG 6	"	"	2,706
IG 7	"	"	1,884
AT 1	Atongo Wanga	Dry hole	13,897
KS 2 bis	Ikassa Kongo		Still drilling
RK 1	Rembo Kotto		Still drilling



MARKETING: All production is exported. Local marketing needs are very small.

OIL LAWS

The oil laws of Gabon have been published in an unusually useful and complete series known as *"South and Central Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* It is available from the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, New York 17, N.Y.* The volumes contain all the other major oil laws of Africa as well, and keep them up to date by supplements. Inquiries should be sent direct to the publisher.

No important changes occurred in Gabon's oil laws during 1959.

GABON—Exploratory Wells Drilled During 1959 (By Mobil Affiliates, to September 1, 1959)

Well	Total Depth (Feet)	Results	Location
Lac Wezé-1	8,312	Dry	40 miles ENE of Port Gentil
Bilapé-3	6,079	Dry	30 miles SE of Port Gentil
Bilapé-4	6,486	Non-commercial Discontinued	30 miles SE of Port Gentil
Azilé-1	5,876	Dry	25 miles ESE of Port Gentil
Bilapé-5	5,890	Dry	32 miles SE of Port Gentil

GABON—SPAEF Development Wells Drilled in 1959

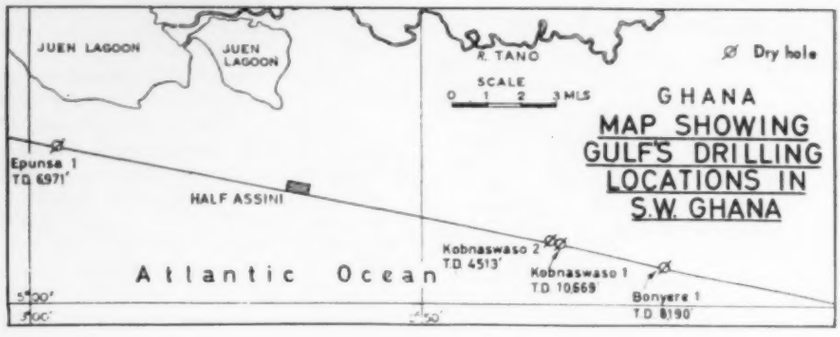
Cap Lopez Oil Field

Wells	Result	Final Depth (Feet)
LO 6	Productive	6,658
LO 7	"	7,201
LO 8	"	6,606
LO 9	"	6,169
LO 10	"	6,293
LO 11	"	6,535
LO 12	"	6,363
LO 13	Dry hole	6,314
LO 14		Still drilling

Tchengué Oil Field

Wells	Result	Final Depth (Feet)
TC 5	Productive	5,472
TC 6	"	4,418
TC 7	"	4,752
TC 8	"	4,354
TC 9	"	4,570
TC 10	"	4,657
TC 11	"	5,051
TC 12		Still drilling

GHANA



EXPLORATION: With its fourth dry hole since 1956, Ghana Gulf Oil Co. (Gulf Oil Corp. subsidiary) early in 1958 shut down its rig on a 200-square-mile tract of onshore and coastal waters in Ghana. The concession, still held, is in a Cretaceous-Eocene embayment. The drilling equipment has been moved to Cabinda (exclave of Angola). In the meantime, the company is evaluating subsurface information obtained before starting a new drilling program. Up to the drilling of the fourth well, the company had spent $1.5 million since June 1956.

Gulf has completed three test wells in Ghana —all dry. Epunsa No. 1, spudded late in 1956, reached 6,791 ft; Bonyeri Nó. 1, spudded in May, went to 8,190 ft; and Kobnaswaso No. 2, begun in September, was abandoned at 4,513 ft. Only slight oil shows and no gas were encountered in these holes.

MARKETING: Early in 1958, Mobil Oil Ghana Ltd. laid a new two-mile 10-in. products pipeline from its tank storage facilities to the offshore tanker berth in the port of Accra.

Ghana oil consumption (crude-equivalent basis) is estimated at 9,000 b/d.

REFINING: There is no refinery in the country. During 1959 a mission from ENI, the Italian government's company, arrived in Ghana to study with the local authorities the possibility of a refinery in that country on a 50-50 basis. The capacity of the planned plant is unknown.

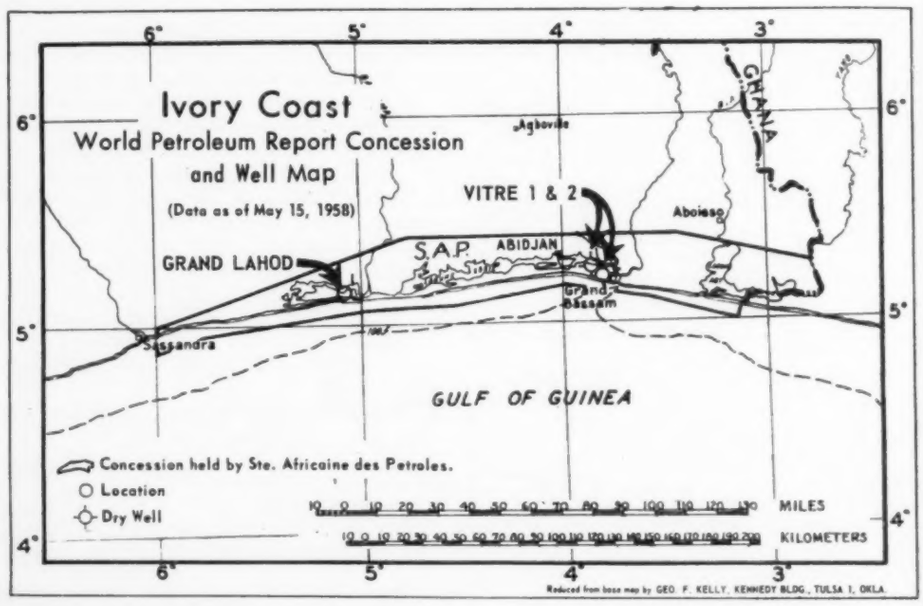
OIL LAWS

The oil laws of Ghana, together with the laws of the remainder of Central and South Africa, have been published recently in an unusual and valuable series. Known as *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* the publication referred to is kept current by supplements which keep this collection complete. It is a word-for-word reproduction of the laws. For information, it is recommended that the publisher be contacted directly through the following address: *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N.Y.*

NATIONAL FACTORS

The attitude of the government is very favorable to investment by international companies. The unit of currency is the Ghana pound, put in circulation during 1958; it is equivalent to the British pound, or $2.80 per pound.

IVORY COAST



EXPLORATION: In this part of French West Africa, the government has approved an agreement between Ste. Africaine des Pétroles, a French company, and Plymouth Oil Co., Benedum-Trees Oil Co., and M. L. Benedum (USA participants). The French company has a 51% working interest; Plymouth Oil Co. has 39%; and the other two participants have 5% each.

The exploration permit (see map) covers the whole of the Ivory Coast Tertiary-Mesozoic basin, a narrow trough limited to the north by a large fault. Several wells have been dry, including a 13,153-ft test at M'Bourouk, 35 miles east of Dakar. Two previous wells had been drilled. Diam Niadie was abandoned at 2,132 ft; and a second well was abandoned at 3,379 ft in the Cretaceous, with no shows.

During 1959 Port Bouet well was drilled to 12,921 ft. It is located approximately 10 miles east of the town of Abidjan, and inland approximately one-fourth mile from the Gulf of Guinea. A few zones of porosity were examined; and the well has been abandoned temporarily while the company investigates a second well now drilling, Lagune Berou No. 1, about 29 miles east.

PRODUCTION-MARKETING: There is no production of oil, nor refining. Marketing needs are imported and rising rapidly, with 448 filling stations at the end of 1956 and a sharp rise in consumption in recent years.

OIL LAWS

During 1959 an usually complete publication appeared containing the oil laws of South and Central Africa, including the laws of the Ivory Coast in English translation. The collection is known as *"Cental and South Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* It is recommended as an unusually reliable source not available elsewhere. Information on it should be obtained direct from the publisher, *Petroleum Legislation, P.O. Box 1591, Grand Central Station, New York 17, N.Y.*

NATIONAL FACTORS

The principal limiting factor has been the French government's requirement that over 50% of the operating company be held by French companies. The degree of governmental control to which a company is subject makes this requirement less important since, even if less than 50% French ownership were permitted, the amount of control by the French government would be very high.

LIBERIA

No exploration has been reported. During the latter half of 1958, Liberian American Exploration Corp. was awarded a concession to explore for oil, gas, and other minerals. No exploratory work had commenced prior to the end of the year.

In 1953, the government granted a 70-year concession to the International African American Corp. which covers oil and gas, among other minerals. No report on the company's activities is available.

There are no refineries, and no domestic pro-

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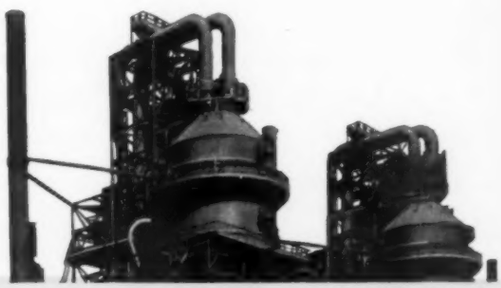

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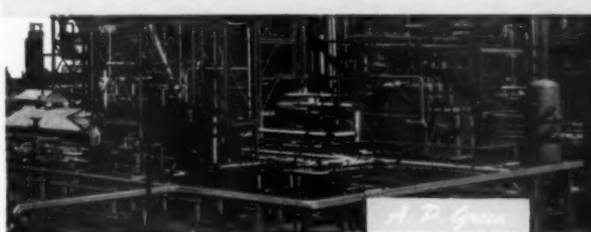

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duction. Oil needs are all imported.

OIL LAWS

The controlling statutes for oil exploration are Chapters V and VI of Title 24, Liberian Code of Mines (1956). This legislation is contained in a recent publication, *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* which appeared in 1959. It is unusually complete, and includes the oil laws (in translation for those which appear in French or other languages) of all the rest of Africa, excluding the five northern countries which are contained in a separate series of volumes. Information regarding this publication, which is highly recommended and accurate, may be obtained from its publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

Several major international companies, including Firestone, have invested in the country. Liberia was founded by former American slaves in 1847, and only negroes may become citizens; but companies may be granted oil exploitation rights.

In the case of concessions, exemptions from import duties on necessary materials and equipment may be allowed, and tax exemption can be granted during an initial period of up to five years. There are export duties on minerals, but there is no limit on the earnings an investor may transfer from the country. There is free currency convertibility, and no restriction on the movement of capital into or out of Liberia. Income-tax laws are similar to those of the United States, with a fixed ceiling of 25% on the taxable income of corporations. The currency of Liberia is the United States dollar, supplemented by Liberian coins. Government structure is patterned after that of the USA.

LIBERIA—Imports, 1958
(Thousands of Barrels)

	Gasoline	Kerosine	Gas, Diesel, Other Fuel	Lube Oils	Total
U. S.	88	13	64	9	174
Iraq	93	6	103	—	202
Other	—	1	—	1	2
Total	181	20	167	10	378

Source: US State Dept., Monrovia.

PORTUGUESE GUINEA

EXPLORATION: There have been no wells drilled, but in 1958 a concession was granted Esso Exploration Guiné, subsidiary of Standard Oil Co. (New Jersey) covering most of the colony, including offshore and archipelago areas.

Esso Guiné began exploration in Portuguese Guinea a little more than a year ago. To date a small amount of surface mapping has been done, mostly in areas adjacent to the concession, due to the absence of outcrops. The area has been covered in reconnaissance fashion by a gravity meter, and a nominal amount of seismic work has been done. Surveying is still in progress in the area. There has been no drilling performed under the present contract.

OIL LAWS

The oil regulation of Portuguese Guinea and the concession contract of Esso Exploration there, are contained in an unusually complete and accurate compilation which came out late in 1959. It contains the laws and concessions governing oil exploration and development in other countries of Africa (excluding North Africa, which are contained in a separate series) as well. Known as *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* it is available from the publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries for more information should be sent directly to that address.

The Esso concession was granted by Decree 41,537 of February 28, 1958. It calls for a minimum expenditure of $7 million over a five-year period, the first three-year initial duration being extendible two more years on completion of a first-year expenditure of at least 30 million escudos (about $1.05 million), minimum 34 million escudos second year, and a minimum of 54 million escudos during the third year.

The Esso company is registered as a Portuguese concern, with main offices in Portugal and majority of the board Portuguese. In event of discovery, exploitation rights will run for 40 years, with renewal for 20 years additional. Profits are to be divided 50-50 in event of discovery, with the 12½% royalty deductible. The government may purchase up to 37.5% of annual production, based on a fixed-price formula.

In the event any of the Jersey Standard group sign more favorable contracts with African or Persian Gulf countries, talks will be held for a revision of the concession's provisions.

The government is entitled to 20% nonvoting nonasset shares in the enterprise.

SENEGAL

EXPLORATION: A concession (see map) is held by Ste. des Pétroles du Sénegal (SPS). SPS was formed in 1956. BP Exploration Co. has a 30% holding; and BP's French associate, Ste. Française des Pétroles BP, has 20%. The remaining participation is in French (mostly government hands).

Cie. Française des Pétroles has been granted an exploration permit on the southern coast. Two five-year extensions are permitted, with surrender of half the acreage for the first and one-third of the rest for the second. Minimum investment for each five-year period is $4 million.

A wet-gas discovery, flowing 1,271,000 cu ft per day, was made in 1959 near Dakar at No. 3 Cap Vert, drilled by Ste. Africaine des Pétroles. It flowed wet gas from 4,291 ft to 4,314 ft. It also had a slight gas flow from 2,001 ft to 2,024 ft. This was the first indication of oil or gas since exploration started in 1956.

A second wildcat, DN-2, flowed at the rate of 3½ million cubic feet per day of gas, with some condensate, on a six-hour test of a 43-ft sand topped at 2,942 ft. DN-3 was spudded 2½ miles south of DN-2.

On July 20, 1959, two test wells were being drilled for the Ste. des Pétroles du Sénegal. Diourbel No. 1 was in north central Senegal; and the other, Kolobane No. 1, was about 30 miles to the east. Elsewhere in Senegal, two French seismic parties and a BP seismic party are at work for SPS.

SENEGAL—Summary of 1959 Drilling
(By Ste. Africaine des Pétroles)

Well Name	Location	Date Spudded	Date Completed	Total Depth* (Meters)	Remarks
Rd.2	Mont Rolland	11- 6-58	4-13-59	2,075	Dry
CV.3	Cap Vert	4- 3-59	5- 4-59	1,414.20	Gas (1½ mcf per day)
CV.4	" "	5- 9-59	5-29-59	1,500	Dry (oil and gas shows)
DN.2	Diam Niadé	5- 6-59	8-21-59	2,653	Gas (3½ mcf per day)
DN.3	" "	9-11-59	9-30-59	1,432	Testing
Pt.2	Pout	10- 9-59	11-15-59	2,104	Testing
DN.4	Diam Niadé			1,500	Drilling

*Depth as of 11-15-59 or projected depth.

Continental Oil Co. and Cities Service Co. joined Ste. Africaine des Pétroles (SAP) and Cie. de Participations de Réchèrches et d'Exploitations Pétrolières (COPAREX) during December 1959 in exploring in the St. Louis and Richard Toll areas on concessions totaling more than 3,400,000 acres.

In Mauritania, Conoco and Cities Service will be associated with SAP and Ste. de Réchèrches et d'Exploitation de Pétrole (EURAFREP) on a concession covering approximately 7,300,000 acres.

In Senegal, Conoco will own a 25% interest in the concessions; Cities Service, 24%; and the French companies, 51%. In Mauritania, Cities Service will own a 25% interest; Conoco, 24%; and the French companies, 51%.

OIL LAWS

During 1959 the oil laws of Senegal and the concession contract of British Petroleum (SPS concession) were published in an unusually accurate and highly recommended publication. Known as *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* it is available from its publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Requests for more information (the series is kept up to date with new laws, and is available for the rest of the world as well) should be sent directly to the publisher.

SAP is owned 80% by BRP and 10% each by FINAREP and COFIREP. The company's concession was obtained August 23, 1955. Original duration was to December 31, 1957. It may be renewed twice for five years each time, provided minimum investment of 200 million francs CFA [the CFA franc is valued at 175 per US dollar] is made, plus 750 million francs during the second period (first renewal) and one billion francs during third period (second renewal). Area is reduced to 70% of the original area on second renewal. Conversion to exploitation permit is guaranteed if obligations have been fulfilled. If noncommercial discovery is made, the concessionaire may accept government aid covering costs of development, plus 10% of his expenses for profit. If he refuses such aid, the concession is transferred to the government.

KENYA

EXPLORATION: There is no production or refining. In 1958 Frobisher Ltd. (a Canadian mining company with international interests) acquired an oil exploration license (see map) and an exclusive prospecting permit in Somalia. Aerial and ground surveys are in progress. The only part of Kenya now regarded as possibly oil-bearing is along the border with Somalia, along the coast.

REFINING: An agreement recently was signed between the Kenya government and Shell Co. of East Africa and BP (East Africa) for the building of a refinery at Mombasa of about 36,000 b/d capacity. Provision has been made for other local marketers to associate themselves with the venture. Stanvac and Caltex also market in East Africa, and the CFP subsidiary Total entered the area 1958. Formation of the Kenya Oil Co. by well-known local businessmen has been announced in Nairobi. This company intends to market throughout Kenya, and will buy supplies under a 20-year agreement from Caltex (Africa).

The new refinery will serve Kenya, Uganda, and Tanganyika, where total consumption in 1958 was 1,125,000 tons (about 22,500 b/d), including bunkers, but should reach about 1,400,000 tons by 1963, when the refinery will be ready.

OIL LAWS

During 1959 the oil laws of Kenya were published in an unusually accurate and useful publication, known as *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* It is available from the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N.Y.* For further information regarding it, the publisher should be contacted directly. The collection of laws covers all the countries of Africa (excluding the five northern ones), and is kept up to date by supplements, keeping the collection complete.

Controlling Statues: Regulatory legislation in Kenya is as follows: Chapter 171—Oil Production—An Ordinance to Provide for the Exploitation of Certain Lands for Oil (January 1, 1925) (4 pp.); Colony and Protectorate of Kenya—Ordinance No. 34 of 1953—An Ordinance to Amend the Oil Production Ordinance, October 27, 1953; Chapter 171—Oil Production—Oil Production Regulations. (First nine pages comprise the regulations. Remainder is model license and lease forms which have detailed provisions also forming part of oil regulations.)

OIL LAW SUMMARY

The oil mining lease is only granted to a company incorporated in Kenya. Assignment or transfer must be to a Kenyan incorporated company.

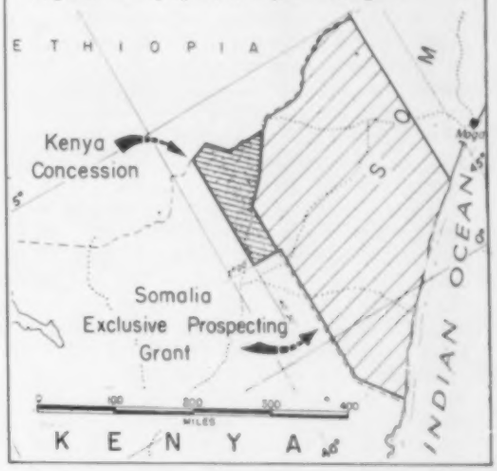
RECONNAISSANCE: The oil exploration license is granted for an initial maximum of two years. It is exclusive. Minimum area is eight square miles. Preferential right is given to an oil prospecting license.

EXPLORATION: An oil prospecting license may be granted whether or not the applicant is the holder of an oil exploration license. Maximum area is 500 square miles. Minimum is eight square miles. Initially granted for not more than four years and renewable at the governor's discretion for 12 more months. It confers the sole right to prospect for oil and the right to sell or export any oil derived from the operations.

EXPLOITATION: An oil lease may be obtained only for an area previously included in either an oil prospecting license or an oil mining lease granted to a former lessee, or an additional area adjoining an already leased oil grant. Granted initially for 21 years, but may be renewed for 10-year periods thereafter. Area varies from four to 100 square miles, unless a special exemption is granted. Rents levied gradually increase, but are deductible from royalty. Each lease contains a clause which calls for a speriodic revision of royalties. Written export permit is mandatory.

KENYA (& SOMALIA)
WORLD PETROLEUM REPORT CONCESSION MAP

Areas shown are held by Frobisher Ltd. of Toronto, Canada. Kenya area is held under a concession agreement, Somalia area is held under Exclusive Research Permit with right to explore for, but not exploit, oil and gas. Negotiations in progress for exploitation rights.



NATIONAL FACTORS

Kenya is anxious to attract foreign capital to the mining industry. An industrial development corporation has been established to aid in initiating, assisting, or expanding industry, business, and other commercial enterprise within the colony.

EAST AFRICA—Imports of Petroleum Products—1958

Product	Unit of Quantity	Kenya	Uganda	Tanganyika	Total value (Thousands of Pounds Sterling)
Aviation gasoline	1,000 Imp. gal	6,218	1,434	970	674
Motor gasoline	"	35,900	20,021	18,692	3,370
Power kerosine (not including illuminating)	"	7,399	748	255	382
Lamp oil (kerosine illuminating oil)	"	11,371	6,003	8,404	1,161
Gas oil, diesel oil, and other fuel oils	"	133,892	12,937	50,282	6,613
Lubricating oils and greases					
Greases	1,000 centals of 100 lb	15	8	12	149
Lubricating oils	1,000 Imp. gal	3,328	953	1,655	1,267
Other oils	"	35	14	3	14
Asphalt	1,000 centals of 100 lb	221	92	97	302
Other	"	5	3	2	30

MADAGASCAR

EXPLORATION: The only exploring company is Ste. des Pétroles de Madagascar, in which the Bureau de Réchèrches de Pétroles has a controlling interest. The government of Madagascar, the Cie. Française des Pètroles, and the Ste. de Réchèrches Minières et Pétroliers Coloniales also participate. SPM has done extensive exploration in a large concession along the western coast of the island, and has drilled a number of dry holes taken beyond 8,000 ft. In some cases, indications of gas were found, but no oil has been discovered.

OIL LAWS

The oil laws of Madagascar have been published, in English translation, in an unusually complete and accurate new publication entitled *"Central and South Africa—Basic Oil Laws and Concessions Contracts (Original Texts)."* The collection includes the rest of Central and South African oil laws and concessions as well. It is kept up to date by regular supplements. For further information, the publisher should be contacted at *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

TANGANYIKA

British Petroleum Development Co. of Tanganyika Ltd. continued geological and geophysical surveying in Tanganyika. In 1958 it drilled its third deep well, Mandawa No. 7, midway between Kilwa and Lindi on the southern coast with the same rig which had been used on Mafia Island and Zanzibar, where wells had reached depths of 11,051 ft and 14,281 ft, respectively, before abandonment. Mandawa No. 7 went below 11,500 ft, with no shows reported. A second well, Lamu No. 2, was dry.

During 1959 three wells were drilled (as of August 1). They were: Pemba No. 1, drilled to 2,500 ft; No. 2, drilled to 2,500 ft; and No. 3 drilled to 518 ft. All three were "strat" tests. A fourth was drilling.

BP-Shell's five-year concession, which had expired in 1957, was replaced in 1958 with a new two-year license—with three possible extensions of one year each. The concession covers 25,000 square miles in Tanganyika and the Island of Mafia. For a concession map, see *World Petroleum Report 1958.*

No activity took place on Mafia Island during 1959. The rig was moved out, following one dry well (see *WPR 1958*, p. 222).

NIGERIA

EXPLORATION: The oil hunt is intensifying, and will reach full bloom in early 1960 when Shell-BP surrender some offshore licenses for which a queue of companies have been waiting. Interest is heightening by the discovery by Shell-BP of oil at Ughelli, 70 miles northwest of Oloibiri. It is in remote country, but representatives of Shell mentioned the possibility of large production. This is a marked change for Shell-BP which had previously spent $117 million in a 22-year hunt which had only yielded some small fields. Provided the Decca survey of the offshore areas can be completed by early 1960, the government has announced it will receive applications for concessions on the continental shelf. According to the announcement, certain prospecting licenses at present held by Shell-BP will expire January 18, 1960. They are No. 8, 9, 10, 11, 14, 15, 16, 17, 18, and 19. Licenses No. 12 and 13 have already been surrendered by Shell-BP. By the terms of Shell-BP's prospecting licenses, the company has a right to take up to 50% of this area under oil mining leases. On the expiration of prospecting licenses No. 8, 17, 18, and 19 held by Shell-BP, within the territorial waters (up to the three-mile limit offshore) areas will become available for application unless included by Shell-BP within their mining leases. The exact position of all areas taken out under oil concessions will be plotted on 1/100,000 sheets which will be reproduced and will be available for inspection by the public.

£48 million had been spent by Shell-BP as of May 1959 in the search for oil in Nigeria. Forty-two exploration wells have been drilled; 14 of these found oil, and may be termed discovery wells. In addition to its exploration wells, the company is now engaged in appraising the production prospects in Afam, Oloibiri, and Bonu. Eight drilling rigs are being used.

Mobil Exploration Nigeria Inc. reached an agreement with the Nigerian government in 1959 for a 2.5 million-acre oil exploration license in the western region of Nigeria, retroactive to April 24, 1958, when exploration work actually began. Mobil Exploration has conducted field geological studies and offshore seismic work in Nigeria, and is continuing onshore seismic studies.

REFINING: There is no refinery at present. Shell-BP Petroleum Development Co. has a concession provision providing that, when its production reaches 10,000 b/d for six months, it must begin discussions looking toward a petroleum refinery. Shell-BP officials say a plant would have to be 20,000 b/d in size to be economic.

TRANSPORTATION: During September 1959, a 14-mile 12-in. pipeline was completed from the Bomu field to the Afam-Port Harcourt area. Another line is being constructed to Bonny, 40 miles south of Port Harcourt; it will be completed in mid-1960, along with ocean tanker-loading terminal facilities.

There are two other lines, one a 30-mile 6-in. crude line from Afam to Port Harcourt, and a 65-mile crude pipeline, part 8-in. and part 10-in., from Oloibiri to Port Harcourt. The first shipment from these lines, and the first Nigerian shipment of crude, was made in March 1958.

NIGERIA—Producing Fields

Field	Depth (Feet)	API Gravity
Afam	9,000- 9,400	36.5-44.5
Akata	5,500- 7,000	48.0
Bomu	7,100- 7,500	31.3
Oloibiri	8,000- 9,500	20.0-26.0
Soku	10,600-10,650	33.8

PRODUCTION: During 1959 crude production was 12,000 b/d.

According to a company representative, Shell-BP Development Co. of Nigeria expects crude production to rise to 35,000 b/d during 1960.

OIL LAWS

The oil laws of Nigeria recently have been revised, and a final concession grant has been made to Shell-BP. All these new laws, as well as the Shell-BP concessions, were published in late 1959 in an unusual new series of books called *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* The volume is a word-for-word compilation of applicable laws of Africa, including Nigeria. For information regarding this highly recommended collection, the publisher should be contacted at *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

The Council of Ministers in 1959 fixed terms on which oil exploration licenses, oil prospecting licenses, and oil mining leases may be granted in the future. The terms will follow generally the existing Oil Exploration Licenses, Oil Prospecting Licenses, and Oil Mining Leases, but are "modified in the light of present conditions." Nigeria will redraft existing forms of Oil Exploration Licenses, Oil Prospecting Licenses, and Oil Mining Leases.

The Federal Ministry of Lagos Affairs, Mines, and Power in Nigeria has sent oil companies copies of the new basic terms. They have sections covering (1) oil exploration licenses covering areas north of 7 deg. north latitude; (2) oil prospecting licenses covering areas south of 7 deg. north latitude, including the continental shelf; and (3) oil mining leases for the whole of Nigeria, including the continental shelf.

The Federal House of Representatives in February 1959 passed legislation limiting the government's share of profits from petroleum to 50%, including all taxes and royalties. The request by some oil companies that the legislation include definite time limitations was overruled.

On June 1, 1959, Chief Festus Sam Okotie-Eboh announced that an agreement had been reached between himself and the Shell-BP Petroleum Development Co. embodying the 50-50 profit-sharing principle and limiting the time of the agreement to the period during which existing mining licenses and leases are valid. Under the terms of the contract, existing profit-sharing arrangements will be renegotiable when existing leases are due to be renewed. The agreement covers all present Shell-BP exploration licenses, prospecting licenses, their renewals and extensions, and mining leases. Exploration licenses are granted for two years, and are renewable for one year. Prospecting licenses are granted for three years, and are renewable for two. Mining leases are granted for periods of 30 years.

A memorandum from the Shell-BP to the government, dated the same day as the contractual agreement, states that the government may request consultation if the Shell-British Petroleum enter into a new agreement with any other country on the continent of Africa in which such other country's stated percentage share of profits is higher than 50%.

Par. 2 of the contract states that Shell-BP "shall not be subjected to any federal tax, duty, rate, or other due which is a disproportionate imposition against or which in effect discriminates either directly or indirectly against the company or aganst companies engaged in petroleum operations as defined in the ordinance."

Other points of interest are: Shell-BP has agreed to pay royalties of 12½% on oil extracted from areas in which the company is licensed to prospect instead of the previous flat rate of four shillings (about US $0.56) per ton; the federal govenment has agreed to try to prevent discriminatory taxation by regional or local governments; Shell-BP has agreed to pay 20 shillings (or approximately US $2.82) per square mile for rents on lands in which they are licensed to prospect for oil. The previous rental rate was 10 shillings (or approximately US $1.41) per square mile.

NATIONAL FACTORS

Attitude Toward Investors: During October 1958, the government stated that the Governments will encourage overseas capital and skills in every form of industrial enterprise, stating:

> Our governments wish to give every support to the principle of partnership between overseas and indigenous capital and skilled personnel. We prefer that, where there are willing Nigerian investors, they should be associated with new enterprises. Some public funds are available for investment in suitable enterprises seeking local participation. There will generally, however, be no rigid insistence on local participaiton, but governments may wish to share in the financing of certain large enterprises which have a special significance to the public."

History: Nigeria became a British colony in 1914. After World War II, nationalist sentiment resulted in the formation af a loosely federated State which already has autonomy in internal affairs, and will become independent October 1, 1960, the largest single area to break away from Britain since India.

There is friction between the northern and the other two regions, partly because of historical and religious differences, but principally because of the fear of the northern hereditary rulers that they will be swamped by an influx of the more sophisticated and better educated Negroes from southern cities. The Moslem North has remained pastoral and semi-feudal, while the South has eagerly accepted western ideas and training. The North has attempted to delay the granting of full independence until local administrators have been trained to take over when the British relinquish control.

Income Tax: At the present time, Nigeria has no taxation ordinance referring specifically to petroleum operators, but the Ministry of Finance has under consideration new proposals for such an ordinance. In the meantime, under the Income Tax Ordinance, tax is levied upon the chargeable income of every oil company at the rate of eight shillings in the pound.

After the grant of complete independence to the country, it seems likely that nationalist feeling will demand the formation of a Nigerian operating company, possibly with participation by the Nigerian government or by Nigerian private capital.

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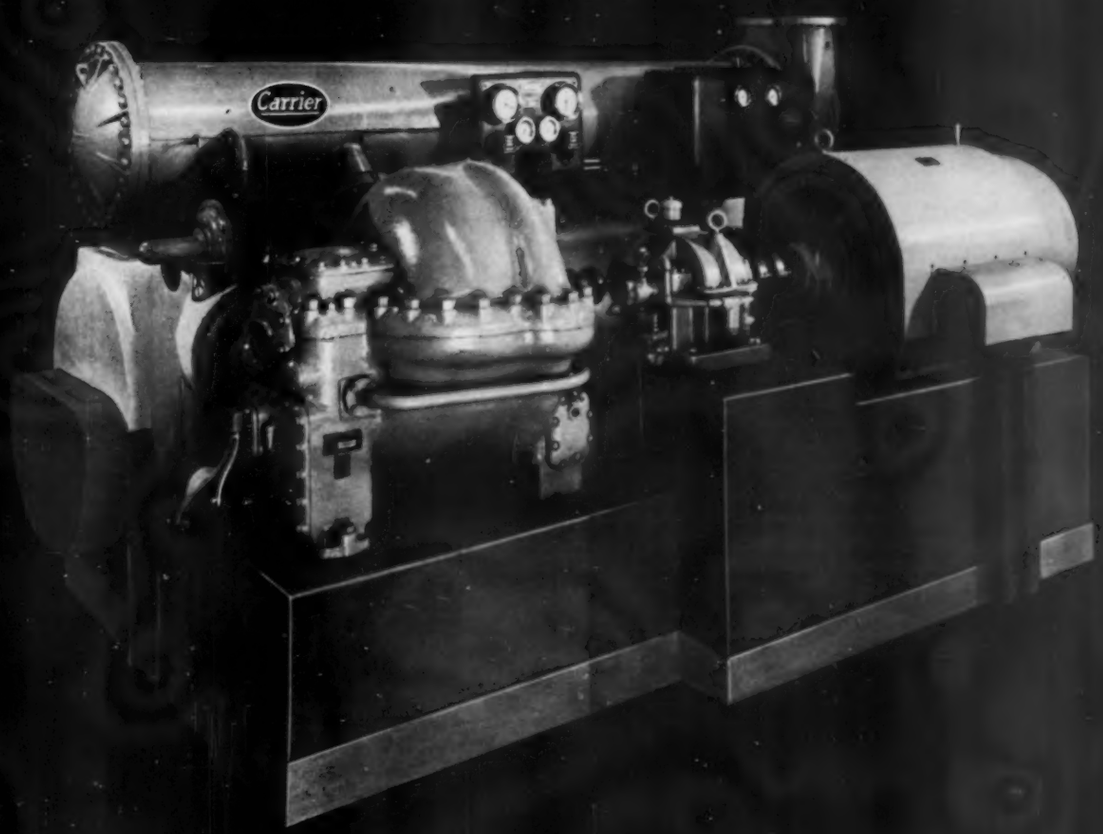

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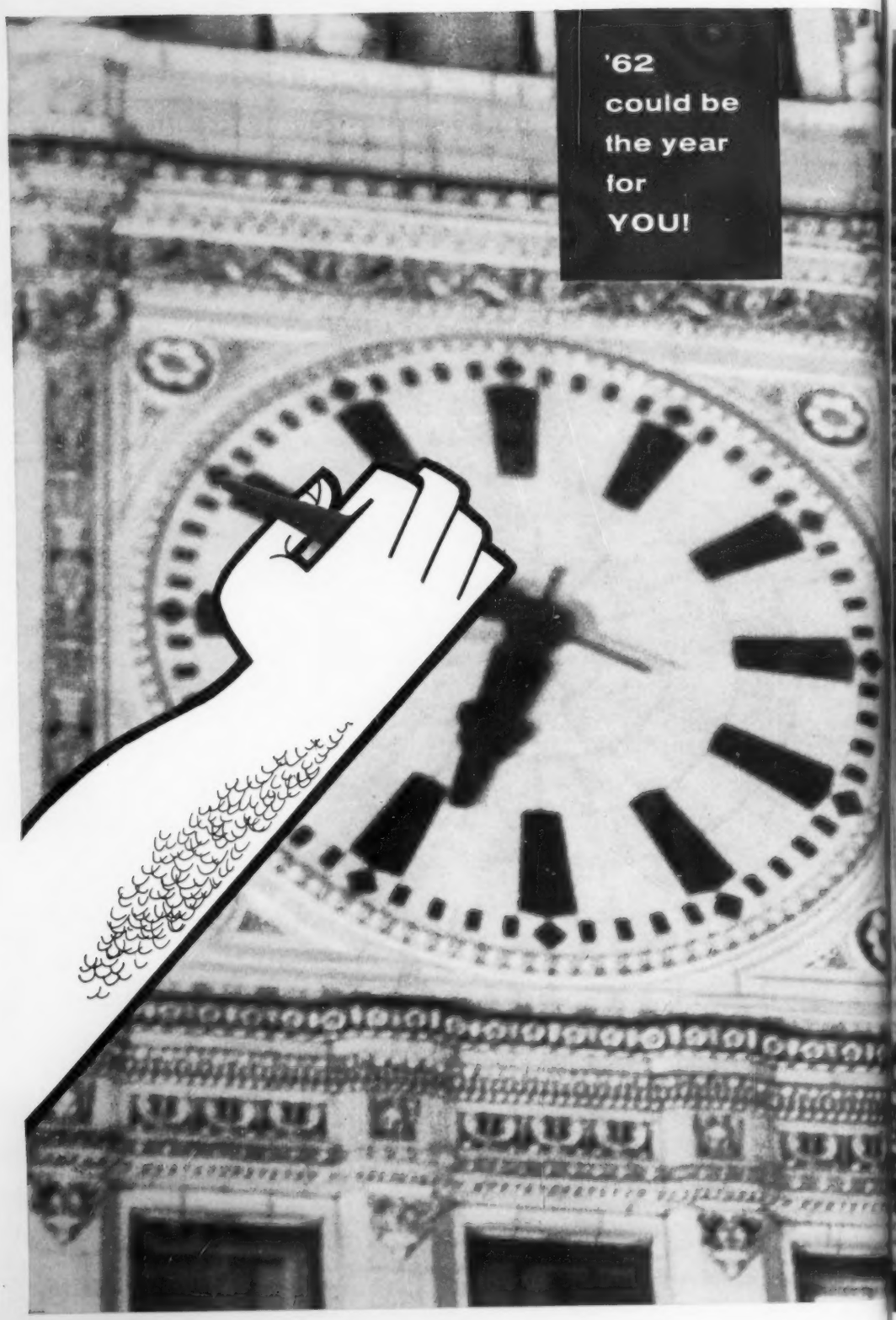
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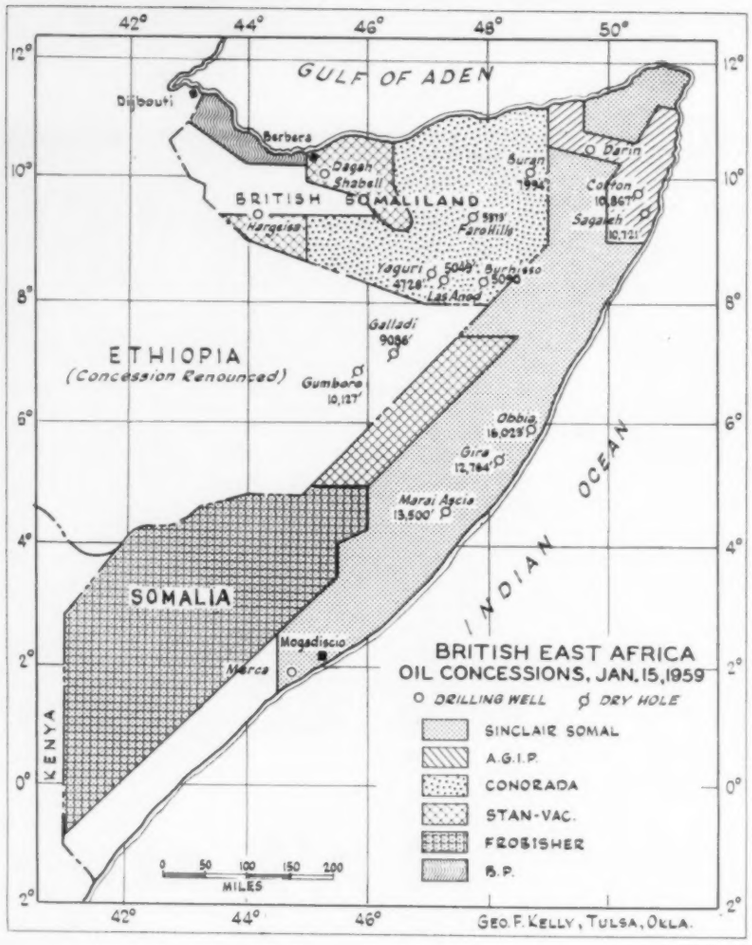
SOMALIA

EXPLORATION: Interest has risen despite several dry wells in this large area. In the north (see map), the Italian government—through AGIP, an ENI subsidiary—has drilled three wells, and is currently on its fourth. The first was Sagaleh No. 1; dry at 10,722 ft in 1956. The second was Catton No. 1 (alternate spelling, Cotton), located at longitude 50° 30′ 54″ E.; latitude 9° 32′ 43″ N.; about 40 miles north of Sagaleh; dry at 10,867 ft. Neither had oil shows, although Catton had some gas shows. The third well, Darin, went below 9,000 ft, and was dry. Its location is longitude 49° 44′ 47″ E.; latitude 30° 39′ 46″ N.

In the south, Sinclair Somal Corp., owned by Sinclair Oil Corp. and Coronada Petroleum Corp. on a 50-50 basis, drilled four wells. First was Gira No. 1; dry at 12,764 ft. The second was Obdia No. 1, one of the deepest wells in the Eastern Hemisphere; dry at 16,023 ft. A favorable marine sedimentary section was reported in both. The third test was drilled at Marai Ascia; abandoned, September 3, 1958, at 13,500 ft. The fourth test is known as Merca No. 1, near Mogadisco, and was dry 11,000 ft. during 1959. Duddumai is now drilling.

A third organization, Standard Vacuum Oil Co., during 1957 obtained a concession, and began surface work in 1958.

Frobisher Oils Ltd. has an exclusive exploratory permit southwest of the Sinclair Somal Concession (see Kenya section herein). A Denver independent, Merritt C. Orr, has a nonexclusive permit in the same area as Frobisher, and another permit west of the area once held by Sinclair on the tip of the "horn."



OIL LAWS

The oil laws of Somalia and the concession contract of Sinclair Somal have been published recently, and are now available, along with the legislation for the remainder of Africa. They are found in an accurate and complete compilation known as *"Central and South Africa—Basic Oil Laws and Concession Contracts."* It is available from its publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries for information should be sent directly to that address.

SINCLAIR SOMAL CONCESSION SUMMARY

(Signed May 8, 1952)

EXPLORATION: Permit includes drilling. **Duration:** Nine years. If discovery made, may be converted to mining concession. **Area:** Must surrender 25% end first five years, 25% original area end of 10 years; areas chosen by company. **Discovery:** If discovery made, mining lease has 40-year life, extendible twice for 10 years each time. **Rental:** $50,000 first year; $150,000 second year; $200,000 third year; $300,000 per annum fourth and fifth years; $500,000 per annum sixth to 10th years. Expenditures creditable against royalty. **Drilling:** Well to be begun before end of 4th year.

EXPLOITATION: On discovery, company may choose "producing area"; may not be less than 100 sq km; no other limit on number of "producing areas" within permit limits. **Rental:** If discovery made within five years of May 8, 1952, company will pay $100,000 somalo per annum until end 5th year; $75,000 somalo per annum 6th to 10th year; 11th year and after $50,000 somalo per annum. If production found more than five years after May 8, 1952, will pay $75,000 somalo per annum until 10th year, $50,000 somalo yearly thereafter. Additional rental payable following discovery, 100 somalo per sq km. **Royalty:** 12½% in kind or in cash during first five years following discovery; thereafter 15%. If at end 10th year better terms paid in Near or Middle East, royalty will be revised. **Pipelines:** Company may install pipelines whenever needed. **Employment:** May use foreign personnel if none suitable found in country. **Taxes:** Company subject to all general taxation of the country. **Stock:** If company sells stock, 20% must be offered to Somalis. **Surrender:** Any time on 12 months' notice. **Arbitration:** Settled by arbitrators, one from each side, plus impartial referee.

NATIONAL FACTORS

Somalia is not a nation yet, but will be in 1960 if present plans go through. Under her present status as a mandate administered by Italy, oil negotiations are conducted through the United Nations and the Italian ambassador to the United Nations. A three-man council is presently administering oil, composed of an Egyptian, a Colombian, and a Filipino.

MIDDLE CONGO

EXPLORATION: One company, SPAEF (see Gabon section), is exploring. It has found one small field, on the Pointe-Indiènne structure, where the first well crossed a thick level of salt at 1,625 ft. up to 4,210 ft. with strata of anhydrite and potassium salt. The well struck oil in a trap between 4,438 ft. and 4,530 ft. Six wells followed, but only three of them encountered production. One went to basement at 10,496 ft. Drilling is still going on. On the Pointe-Noire structure, a wildcat, well No. PN 1, was dry. Numerous shows, generally correlated with those of Pointe-Indiènne, have been encountered. One seismic crew is at work in the northern region of Pointe-Noire. Wildcat TBI was dry in 1959.

Exploratory and development drilling by SPAEF during 1959 is given in an accompanying table.

MIDDLE CONGO—Exploratory Wells Drilled in 1959 by SPAEF

Wells	Location	Result	Final Depth (Feet)
TB 1	Tchibota	Dry hole	12,772

MIDDLE CONGO—Development Wells Drilled in 1959 by SPAEF
Pointe—Indiènne Field

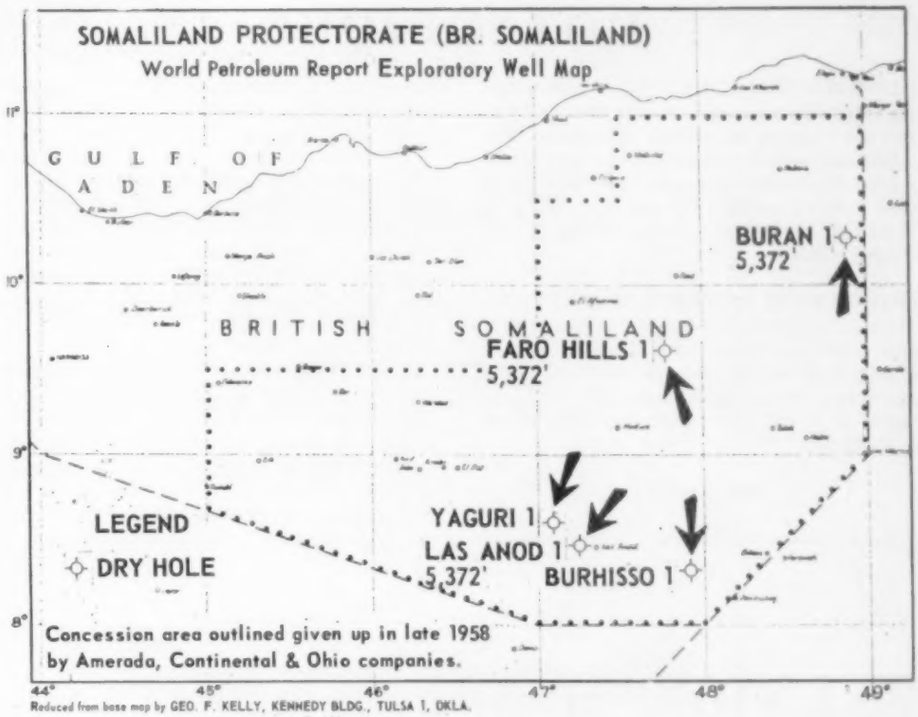
Wells	Result	Final Depth (Feet)
PI 9 bis	Productive	5,572
PI 10	"	4,559
PI 11	"	4,614
PI 12	Dry hole	4,592
PI 13	Productive	5,018
PI 14	"	4,730
PI 15	Dry hole	5,116
PI 16	Productive	5,326
PI 17		Drilling

SOMALILAND

EXPLORATION: Amerada Petroleum Corp., operator for Conorada Petroleum Corp. (which is jointly owned by Amerada, Ohio Oil, and Continental companies) gave up its concession area and retired from the country during 1958 after having drilled four dry wildcats. That left only British Petroleum and Standard Vacuum exploring. One of the reasons why Conorada gave up its area is the drilling obligation, which requires a rig in continuous operation.

Standard Vacuum spudded its first wildcat, Dagah Shabell No. 1, 50 miles south of Berbera on the Gulf of Aden, in December 1958. A small show was obtained, but No. 2 was drilled and abandoned at 4,768 ft. without shows. No. 3 was begun, and during 1959 had some shows of oil and low-pressure gas from about 400 ft.

British Petroleum will drill five wells—one of them southwest of Berbera. Marine seismic surveys started offshore in early 1960.



OIL LAWS

The oil laws of Somaliland Protectorate were published in an unusual compliation during 1959 entitled, *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts.)."* The oil laws and major concession agreements of most of the rest of Africa (excluding the northern countries) are included in this word-for-word reproduction and English translation, where needed. It is a highly recommended publication, and inquiries about it will be gladly answered by the publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

The basic law for petroleum is Ordinance No. 6 of 1943, supplemented by Mineral Oil Regulations, 1943. Subsoil is vested in the crown, except where such rights may have been expressly granted prior to April 19, 1928.

Oil rights may be granted only to a company incorporated in "His Majesty's dominions." Applicant must submit evidence as to his financial and technical qualifications.

OIL LAW SUMMARY

RECONNAISSANCE: Oil exploration licenses may be granted subject to payment of Rs. (rupees) 675 per 1,000 square miles. **Area:** Minimum eight square miles. **Duration:** Two years. May be renewed for 12 months.

EXPLORATION: Oil prospecting licenses may not exceed 500 square miles. May be renewed for an additional 12 months. **Rental:** Three rupees per square mile, doubled to six rupees for the renewal term. **Royalty:** 12½% of the value of the oil, and two annas per 1,000 cu ft sold on natural gas (reduced to half where the gas is sold for repressuring purposes).

EXPLOITATION: Oil mining leases may not exceed 100 square miles (unless special exemption is granted by the governor). Initial term may not exceed 30 years, subject to renewal for an additional 30 years. **Yearly Rental:** 11 annas per acre first year, rising to Rs. 4.0 in the tenth and subsequent years of the lease. **Royalty:** 12½% for crude oil, and 2 annas per 1,000 cu ft of gas. Lease contains a clause providing for periodical revision of royalties at the governor's discretion.

ZANZIBAR

EXPLORATION: A concession covering the entire island of Zanzibar is held by BP-Shell Petroleum Development Co. of Zanzibar Ltd. In 1959, the company drilled a dry wildcat to 2,500 ft. at Tibirizi, and another well between Chake and Chonga. It drilled a deep test in Zanzibar during 1956 and 1957 to 14,281 ft, but abandoned it with no shows.

OIL LAWS

During 1959, the oil laws of Zanzibar were published by *Petroleum Legislation Ltd.*, in a series of bound volumes which contain the rest of Africa's oil laws and concession contracts as well. The volumes are known as *"Central and South Africa—Basic Oil Laws and Concession* Contracts *(Original Texts)."* They are kept current by supplementary volumes. For information, the publisher should be contacted at *P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

Governing Statutes: Applicable petroleum legislation and some related laws of importance are: The Mining (Mineral Oil) Decree, 1951; The Mining (Mineral Oil) Regulations, 1952 [Legal Supplement (Part II) to the *Official Gazette* of the Zanzibar Government, Vol. LXI, No. 3383 of January 12, 1952]; Govt. Notice No. 2, published 12/1/52; The Customs Management Decree, Govt. Notice No. 3, published 12/1/52; The Income Tax Decree, 1940—The Income Tax (Double Taxation Relief) (United Kingdom) Order, 1952.

OIL LAW SUMMARY*

The Mining (Mineral Oil) Regulations state that petroleum rights may be issued to a corporation only when incorporated in the protectorate.

There are no limits imposed upon the area or number of petroleum rights which may be held by one person or company. It is within the power of the resident to incorporate any terms he deems necessary in each license or lease, including the amount of the bond required for assurance and compensation.

RECONNAISSANCE: An oil exploration license may be granted for any area greater than eight square miles. The initial term of such a license may not exceed two years, but renewals are permitted for three further terms of one year. The fee for an oil exploration license is 1,000 shillings for every 1,000 square miles in the licensed area, but the fee must be at least 2,000 shillings and not more than 20,000 shillings.

EXPLORATION: An oil prospecting license may be granted by the resident for any area from eight up to 200 square miles. These licenses have an initial term of four years, renewable for three one-year terms. More than one prospecting license may be granted the same person provided the areas covered are reasonably close and the total area held is less than 200 square miles. An annual rent of five shillings per square mile, with a minimum charge of 200 shillings, is charged during the initial term of a prospecting license. This is increased to 10 shillings per square mile, with a minimum of 400 shillings payable annually during renewal.

EXPLOITATION: An oil mining lease may be granted upon application to the resident for an area of not less than four nor more than 100 square miles. The area included in the lease must either be held by the lessee under an exploration or prospecting license or be adjacent to an area already held by the lessee. Leases are valid for a term of 30 years with one renewal for 30 years. The annual rent increases from two shillings 50 pence per acre the first year to 10 shillings per year for the sixth and each subsequent year. These rents may be deducted from royalties imposed by the Sultan. The most recent royalties, prescribed by the Sultan in 1956, are 12½% of the value at the field of production for crude oil and natural gas.

* Source: Summary prepared for the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) by Ely, McCarthy, and Duncan; Tower Building, Washington 5, D. C.

MOZAMBIQUE

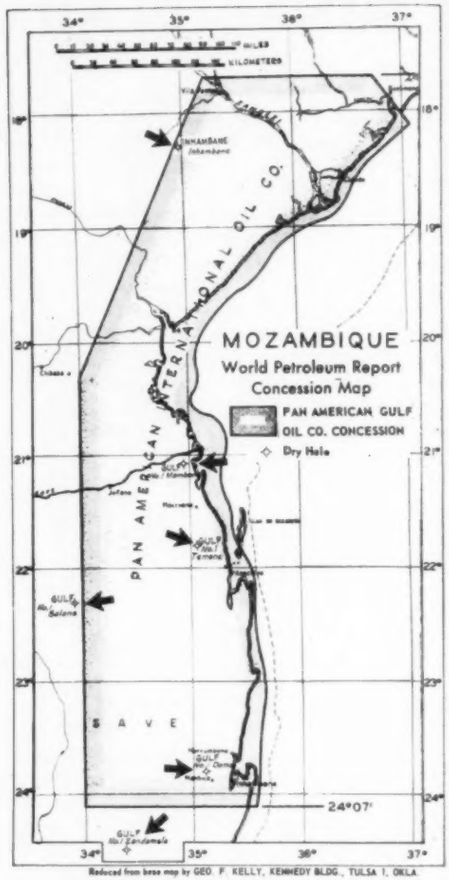
EXPLORATION: Gulf Oil did no drilling during 1959. The rig is stacked after five dry holes, and the company is studying information. The concession expired, and the government granted a fresh exploration concession in 1958 over the same territory to Gulf Oil and Pan American (Standard of Indiana), each holding an undivided half-share.

PRODUCTION, REFINING, MARKETING: There is no refinery, but two SONAP executives have asked government permission to erect a 4,000 b/d refinery in Lourenco Marques. To be owned by a Portuguese company with minimum capital of $1,732,500, capacity could be raised to 10,000 b/d.

OIL LAWS

The new concession contracts in Mozambique, as well as the country's basic oil regulations, have been published in an unusual new series of volumes which appeared for the first time late in 1959. They are known as *"South and Central Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* and comprise a highly recommended compilation not available anywhere else. The oil laws and agreements contained are in English translation. For information, the publisher should be contacted at *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

The Gulf-Pan American concession was signed on October 3, 1958, and provides for an exploration period of three years with an optional extension of another two years, a development period of 40 years with an option on extension of 20 years. The conventional 50-50 profits split is contained, with the also common royalty rate of 12½% included in the government's 50%.



Reduced from base map by GEO. F. KELLY, KENNEDY BLDG., TULSA 1, OKLA.

UNION OF SOUTH AFRICA

EXPLORATION: A total of 10 exploration concessions reportedly has been granted to various local companies and individuals in Southwest Africa. No major company is known to be interested in the area.

No drilling is known to have been done recently. Six wells were recorded drilled to basement in the Dannhouser area of northern Natal, with some oil shows reported.

An aerial magnetometer survey is under way on a concession in Southwest Africa recently granted Trans-American Mining Corp. Ltd. The concession is in the Namid Desert sedimentary basin on the west coast. Trans-American Mining, a Canadian firm, is managing the operations for an American syndicate composed of Charles Payson, Julius Fleischmann, Richard Cowell, Winston Guest, and Waterford Oil Co.

One exploration concession was reported granted to a Mr. Orth in 1959 along the Atlantic. A Mr. duPlessis has been granted a similar concession in the Keetmanshoop district.

PRODUCTION: There is no crude-oil production. Some synthetic fuels are produced from coal by SASOL (South African Coal, Oil, and Gas Corp.) which runs a $134 million oil-from-coal plant at Sasolburg.

REFINING: During 1958, Shell Co. of South Africa announced it will build a $70 million 75,000 b/d refinery near Durban. Caltex (Africa) Ltd. applied for a permit to build a refinery in Durban.

Phillips Carbon Black Co. Pty. Ltd. is being formed jointly by Phillips Petroleum Co. and Industrial Development Corp. of South Africa to manufacture carbon black. For operation within two years, initial capacity is to be 22 million pounds per year of oil blacks.

MARKETING: The value of imports of petroleum and products dropped to £40.2 million in 1958 from £43.9 million in 1957 due primarily to a sharp cutback in demand for bunker fuels after resumption of shipping in the Suez.

OIL LAWS

Oil in South Africa is governed by the National Oil Act of 1942. This act does not cover operations in detail; it merely lays down general rules, with rentals to be fixed by the Ministry of Mines—which also recommends the royalty payments to be fixed, profits division, etc.

More exact conditions have been laid down for prospecting in South West Africa. These conditions are specified in the Foreign Service Despatch from Cape Town of December 17, 1957. They are covered in the accompanying résumé.

UNION OF SOUTH AFRICA—Refineries
(As of July 1, 1959)

Company	Location	Crude Capacity	Type	Cracking Capacity
So. Africa Torbanite Mining Boksburg N. & Refining Co.	Transvaal	2,000	SAC	2,000T
Standard Vacuum Refining Co. of So. Africa, Pty. Ltd.	Durban[1]	21,000	Comp.	10,000C

[1] 2,000 b/d thermal reforming, 250 b/d cat-poly; 4,900 b/d crude capacity being added. Cracking facilities include powerforming and hydrofining. Has 3,200 b/d vis-breaking; 1,000 b/d asphalt facilities.
Key to type: S—Skimming. A—Asphalt. C—Cracking. T—Thermal.
Capacities are in barrels per day.

UNION OF SOUTH AFRICA—Imports, 1958
(Thousands of Barrels)

Crude petroleum	9,670
Gasoline	9,875
White spirit	267
Kerosine:	
Lighting	1,520
Power	2,331
Gas oil	3,540
Diesel oil	564
Furnace oil	959
Lubricating oil	953
Paraffin wax	12
Total	29,691

Source: U. S. State Dept., Pretoria.

CONDITIONS FOR ISSUE OF OIL GRANTS—SOUTH WEST AFRICA

Within six months, grantee must provide a bank guaranty that he has at least $280,000 available for prospecting. Prospecting must commence in nine months and be to the satisfaction of the Inspector of Mines. A monthly report must be submitted on or before the 15th of the month following. Grant is valid for 18 months; extension granted only if investigation is not completed or drilling not commenced. A rental shall be paid yearly, in advance. On cancellation or abandonment, rental is not refunded. At least £28,000 must be spent on exploration within the first 18 months, and thereafter at least £84,000 per annum. Audited statement of costs to be submitted every six months. If aerial photographs taken, administration to be provided with a set free.

If oil is discovered, then—with the consent of the administrator-in-executive committee—(a) a smaller area in the grant area may be converted to a mining area; (b) the grant may be transferred to an approved company. Any water well *not* to be closed or damaged. No rights to be ceded or sold without government consent. Failure to comply with instructions shall result in cancellation. Grantee may surrender on one month's notice.

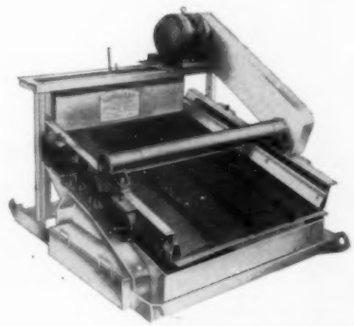
NATIONAL FACTORS

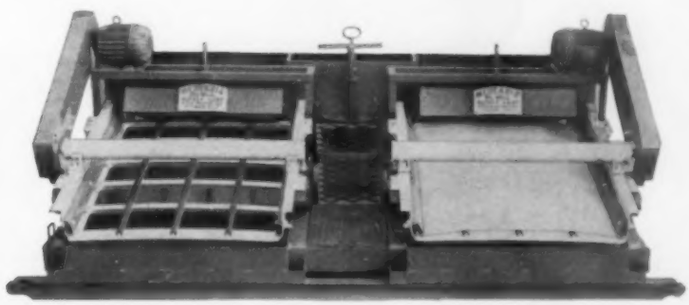
Foreign capital, especially American capital, has been very well treated in South Africa over the past 15 years, and the American mining industry has been given every encouragement to enter the South African mining industry both as an operator and as an investor.

Taxation on base metal mining profits is not excessive. The government of South Africa realizes that foreign capital is necessary in developing the nation's mineral resources and, in order to attract that cpital, has made the investment climate in the Union attractive.

New MEDEARIS TYPE X MUD SHAKERS

with the flow gate control for even flow





SINGLE SHAKER

Newly engineered and redesigned, this new Medearis Single Type X Mud Shaker has fewer moving parts than any other mud shaker. The new flow gate control insures even distribution of flow of mud over the whole screen surface. Simplicity of construction and operation reduce maintenance far below what is usually considered normal. (Some operators report savings as great as 50%.) There are no breakable tension boards. The new, simplified rubber strip deck is easy to install and gives longer screen life. All parts are corrosion-protected, and the vibrator housing and screen box are hot-dip galvanized. The vibrator is roller-bearing mounted and housed for complete protection. Tension and vibration are uniform over all parts of the screen.

Weight has been reduced to facilitate mounting and rigdown. The compact design also contributes to easier handling. Depending upon screen mesh opening and pump capacity, the Medearis Single Type X Mud Shaker will handle up to 800 gallons per minute of average drilling mud. Units can be supplied with or without surge box.

DUAL SHAKER

The Medearis Dual Type X Mud Shaker consists of two Medearis Single Type X Mud Shakers complete with bottom tank and new flow gate control which insures even distribution of flow of mud over the whole screen surface. These dual shakers are equipped with a surge box in which the flow of mud coming directly from the well is slowed down to ensure an even distribution and flow of mud over each shaker. The dual unit is also equipped with a by-pass for by-passing either or both shakers during mechanical maintenance or in the event the operator is using a lost-circulation material which he does not want to pass over the shakers. A cleanout valve located directly in the bottom of the surge box assures easy cleanout operations.

The dual shakers are mounted on a unitized skid so that the entire assembly can be easily tailboarded and loaded on a truck without the need for disassembling or separating the shakers. Mud handling capacity is equivalent to that of two Medearis Single Type X Mud Shakers.

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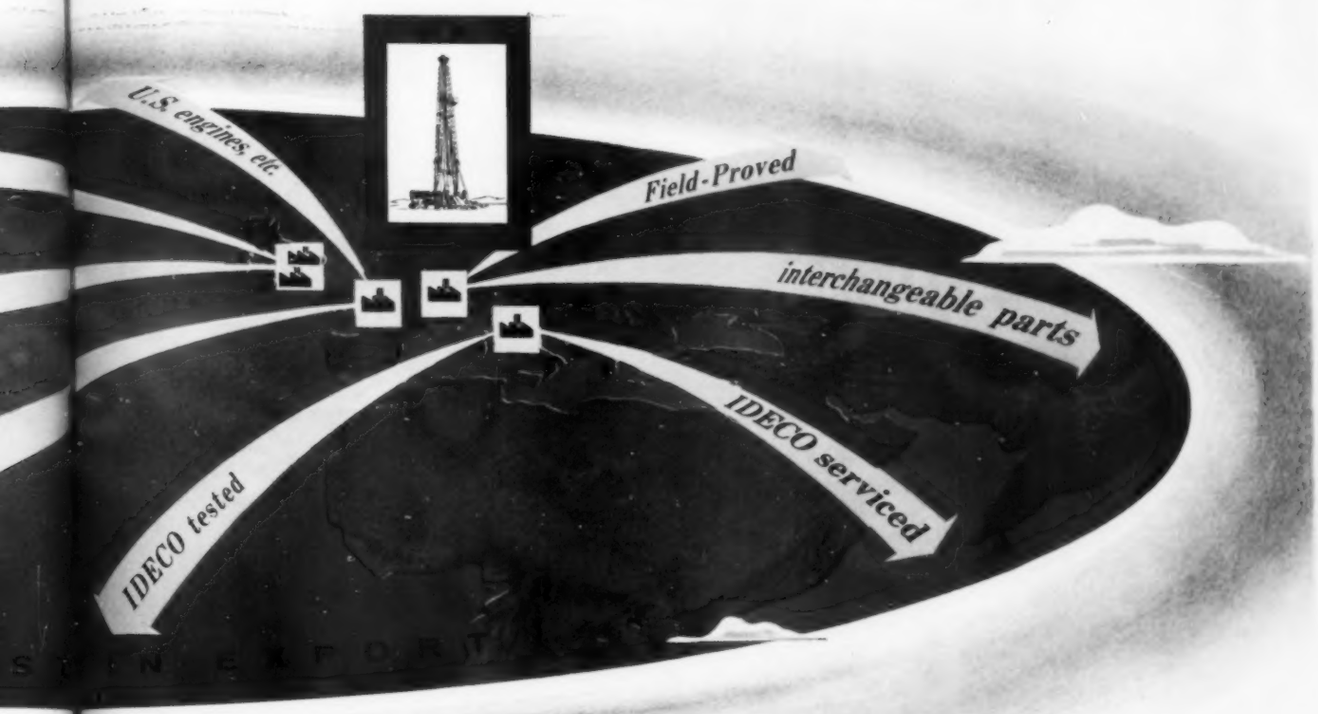

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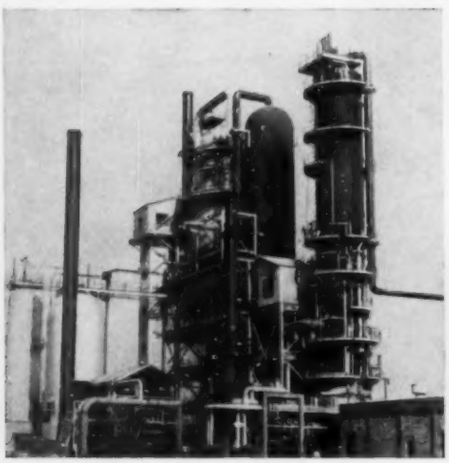
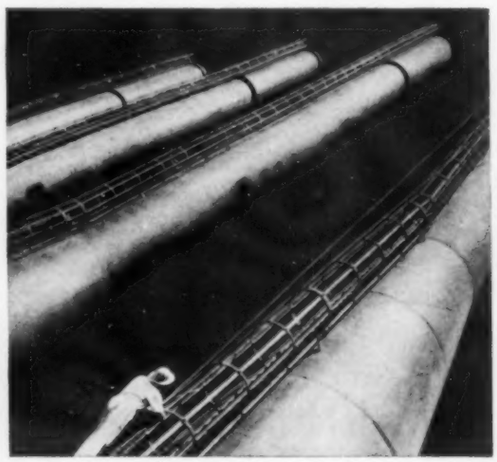


Montreal refinery. Regenerator towers gunited

Kwinana refinery. Towers gunited



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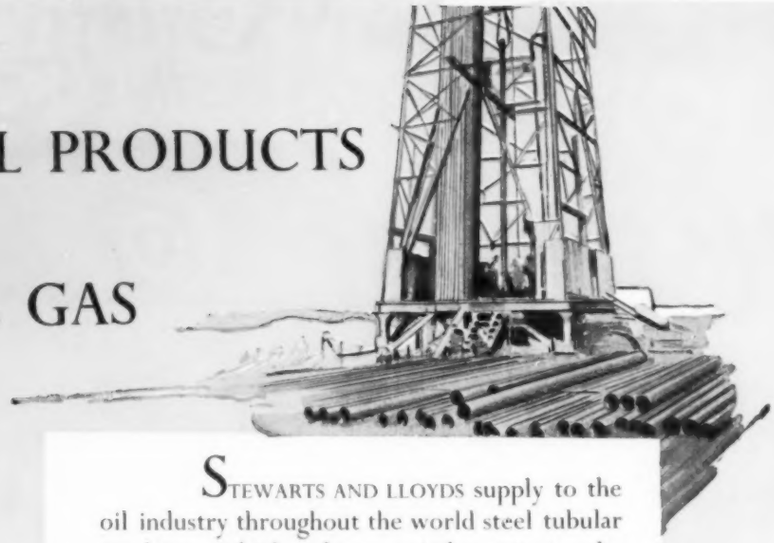

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SUDAN

EXPLORATION: There is no exploration known to have taken place in this huge area. The country is not considered geologically promising for oil; only about 10% of it has any possibilities at all, and these are completely unknown. The worthwhile area is mainly that along the Red Sea coast, but even here the strip of sediments is very narrow.

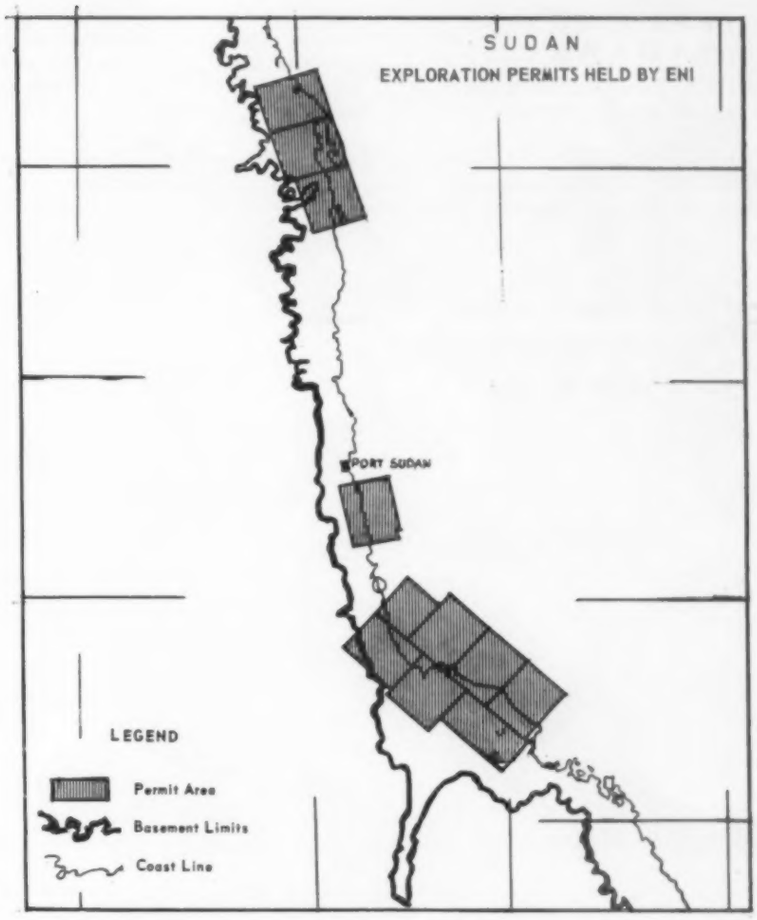
With passage of the new oil law, interest heightened in the Sudan during 1959, and several concession applications were received. AGIP, subsidiary of ENI which is controlled by the Italian government, was granted a 30-year concession on the Red Sea coast, the first concession granted in the country. ENI and the government are equal partners in a newly formed Sudanese company for which ENI's subsidiary AGIP will be the operator. AGIP will advance all the exploration costs for the joint enterprise, the Sudanese government bearing its half share only in case of discovery. Any profits will be subject to the conventional 50-50 division between the partnership company and the government. AGIP undertakes to invest up to £5 million. Eleven exploration licenses have been granted for a period of four years, extendible by two more, and they cover the total of 8,500 square kilometers on the Red Sea coast, including areas beneath Sudanese territorial waters.

Another local company to distribute petroleum products and liquid gas in the country, AGIP Sudan, has also been set up, and AGIP has put forward a proposition to build a refinery at Port Sudan.

General Exploration Co. of California obtained a grant of seven prospecting licenses, covering some 1.4 million acres along the Red Sea coast.

Companies of the Royal Dutch/Shell and BP group have proposed to the government the construction of a refinery at Port Sudan capable of meeting the country's total requirements of major petroleum products.

Meanwhile, the government has given Shell permission to carry out a geological reconnaissance which will cover some 480,000 sq km in the northwest area of the country. This will take four to five months.



OIL LAWS

The new oil law of the Sudan, together with its 1959 amendments, has been published in an unusually complete and accurate compilation which appeared late in 1959. Known as *"Central and South Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* it contains the original oil laws and concessions for all other countries of Africa (northern countries of Africa are in another volume, however) in word-for-word English translation. Information is available from the publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

The Sudan passed a new oil law, The Petroleum Resources Development Act 1958, and during 1959 some later amendments eliminated objectionable features.

The amended version of the law calls for straight 50-50 profit sharing with the government. An earlier provision for a boost in the government's share to 70% after 10 years of development has been dropped.

Art. 9/4 of the amended act reads as follows: "The lessee shall pay: (a) an annual rent, payable in advance, of £60 (the Sudanese pound is worth $2.87) in respect of each square kilometer or part thereof; and (b) a royalty on petroleum produced, which shall be initially calculated at the rate of 15% of the well-head value of all crude oil and natural gas produced, but so that the final royalty payable by the lessee for any one year shall be the equivalent of 50% of the net profits of the lessee for that year."

OIL LAW SUMMARY

REGULATION: Committee of Ministers will supervise through the Petroleum Board, which is responsible for all overall direction. **Application:** Grants made on basis of financial and technical ability, and only to a company incorporated in the Sudan.

EXPLORATION: A license conveys the exclusive right, when discovery is made, "to apply for a lease." **Area:** Maximum eight square kilometers. No limit on number per licensee. **Duration:** Four years; two extensions of two years each permitted, and one more of four years if discovery made. **Fees:** Granting fee: 200 Sudanese pounds (Sudanese pound is valued at $2.87). **Surface Rental:** 10 Sudanese pounds for each 100 square kilometers during first four years, and 200 Sudanese pounds for each year during extension.

EXPLOITATION: Lease confers exclusive rights of exploration and exploitation. **Area:** Maximum 250 square kilometers, with provision for larger area on agreement. **Duration:** 30 years. May be extended 30 more years if lessee has met all obligations. **Termination:** If lessee has not begun production within three years, may be required to begin within 90 days or terminate the lease. **Rental:** Annual rental 60 Sudanese pounds per square kilometer. **Royalty:** 15% on crude and gas produced. Final royalty at end of year to be equivalent to 50% of net profits. **Bidding:** Terminated or lapsed licenses regranted by competitive bids. **Easements and Rights:** Licensee or lessee has right to enter land and use materials; build roads, pipelines, etc. **Bond:** "Reasonable security" may be required, returnable on termination. **Employment:** May require operator to employ Sudanese at all levels and provide for training abroad. **Ownership:** Lessee may be required to permit up to 30% Sudanese participation in capital. **Internal Consumption:** Government may require lessee to meet internal requirements of Sudan before export. **Tax Concession:** Oil considered "approved enterprise" and entitled to tax relief under 1956 act. **Regulations:** Board will formulate regulations to the law. **Fines:** Exploration without license punishable by fine up to 500 Sudanese pounds. Fine on production without lease, up to 1,000 Sudanese pounds.

NATIONAL FACTORS

The general attitude toward investment by international companies is favorable and friendly. The former premier, Khalil, stated that the government would give all possible help to new oil investors; however, he was overthrown by a military coup led by army commander General Irahim Abboud, and little information is available on the new government's attitude.

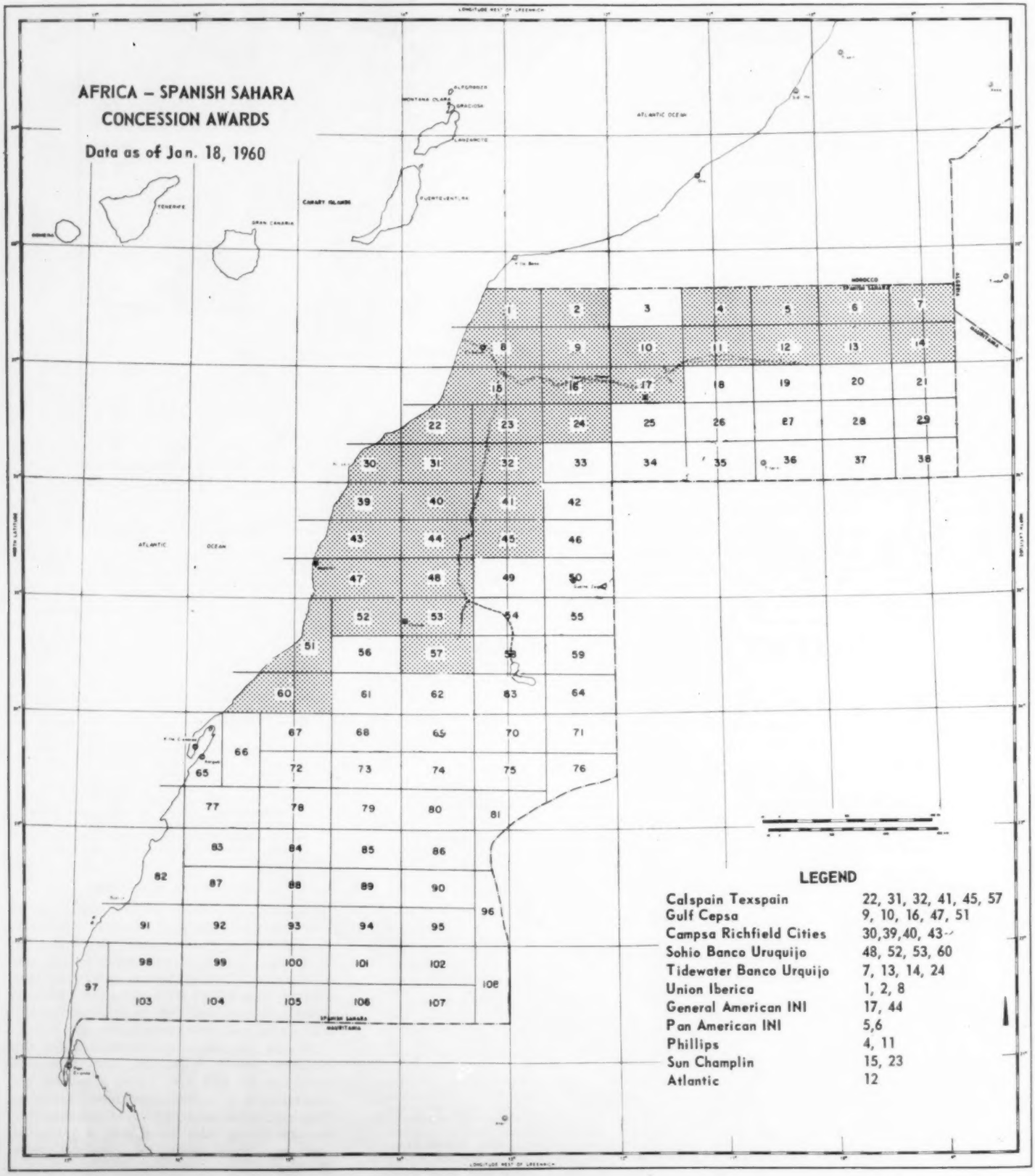
A new par value was established for the Sudanese pound on July 24, 1958. It is now valued at US $2.87156. Under a law for encouragement of foreign investment, incoming forgeign capital can be registered and thus may acquire, among other advantages, a guarantee for repatriation of the original capital and profits thereon.

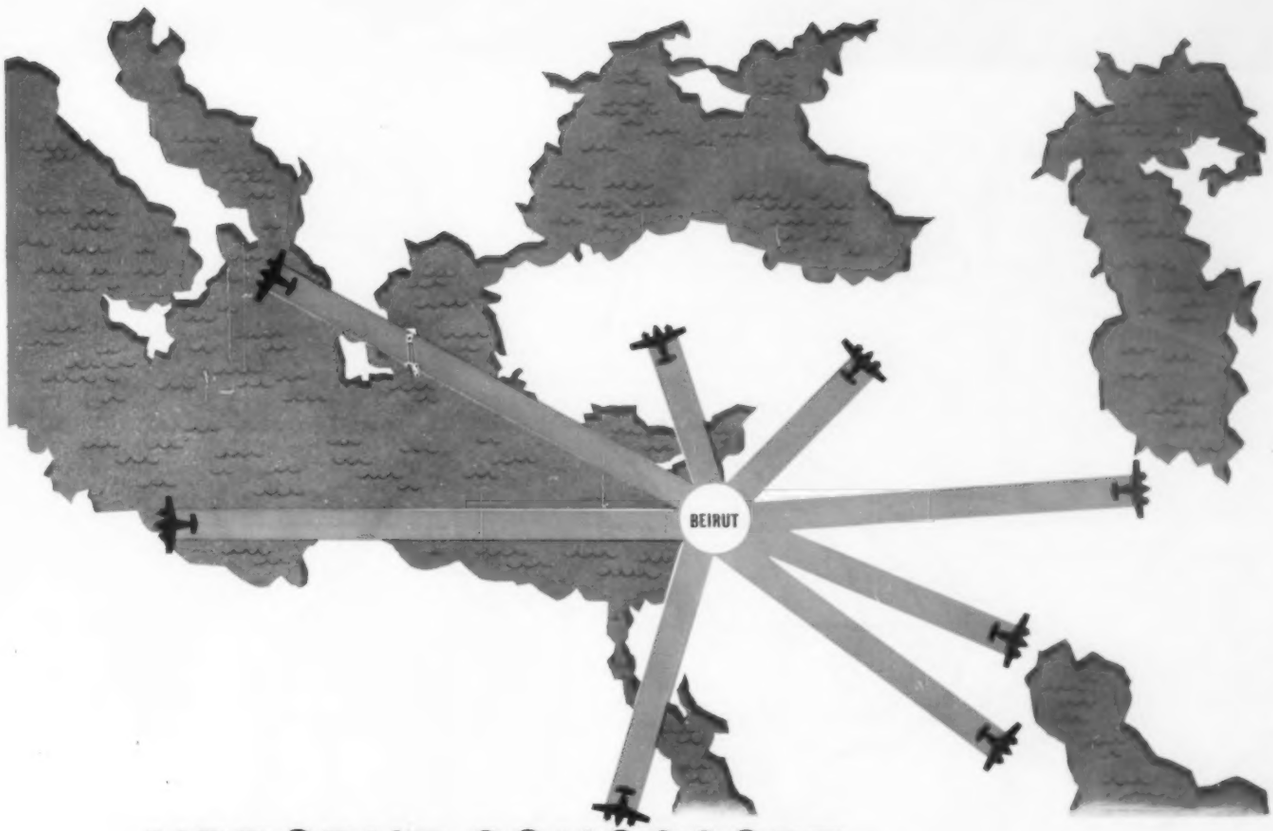
SPANISH SAHARA

EXPLORATION: No exploration is known to have been done in this area, but during 1959 the final passage of Spain's new oil law brought a flood of applications from about 20 companies. The area is completely unknown geologically; and only the coastal area is considered promising.

For details of the law governing this area and the events leading up to the opening of Spain and its African territories to international oil investment, see the section on Spain in this volume.

New grants and realignments in these concession areas are expected soon.





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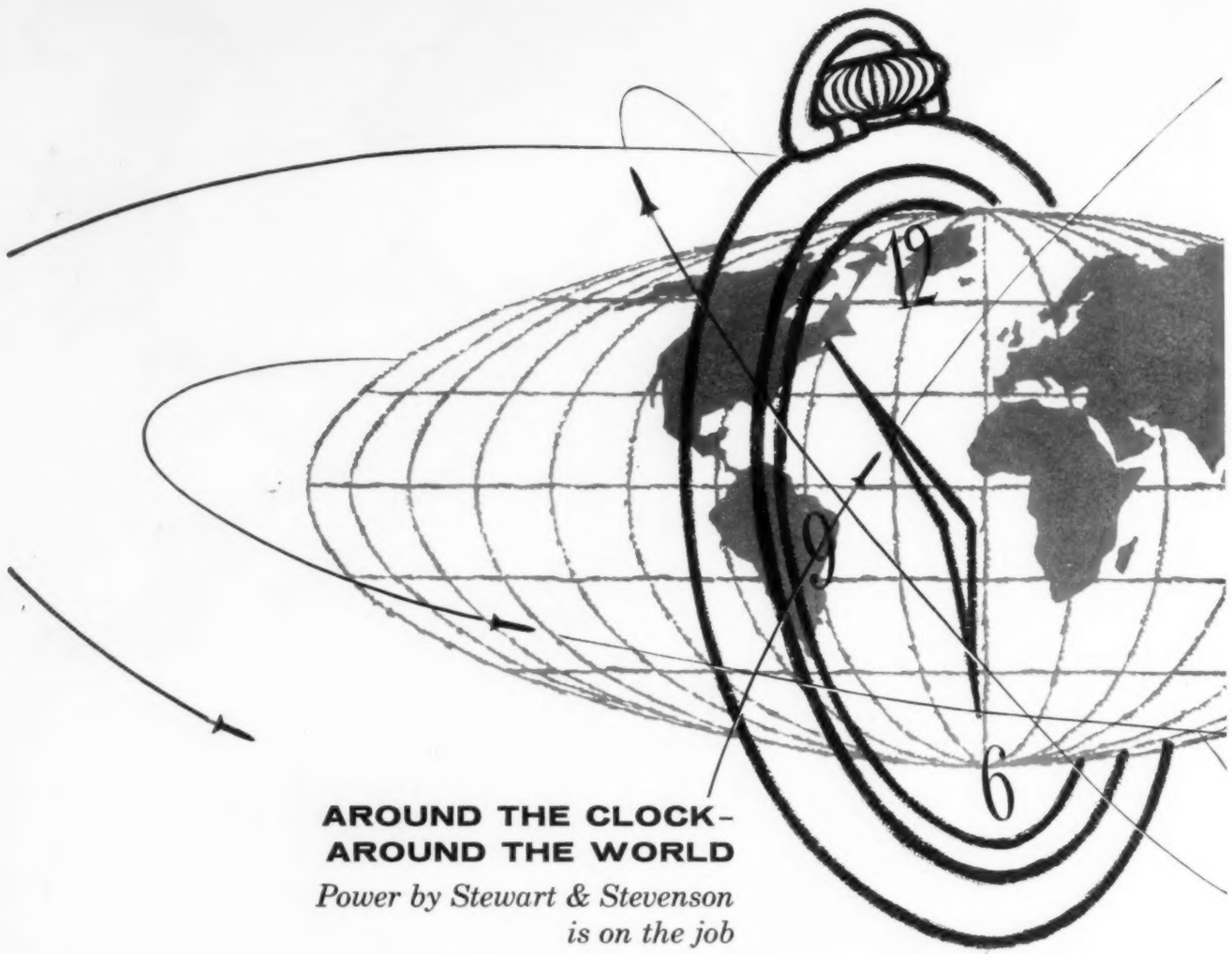

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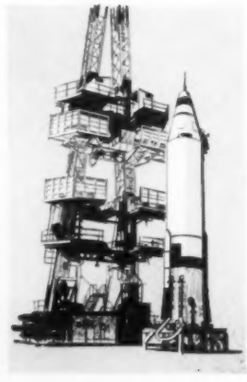

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NORTH AFRICA

Within the short space of a few years, the region of North Africa has become one of the world's most promising oil areas. While the area was scarcely mentioned as a prospective oil producer in literature previous to 1955, it has occupied an increasingly important position in the world's oil industry since that time.

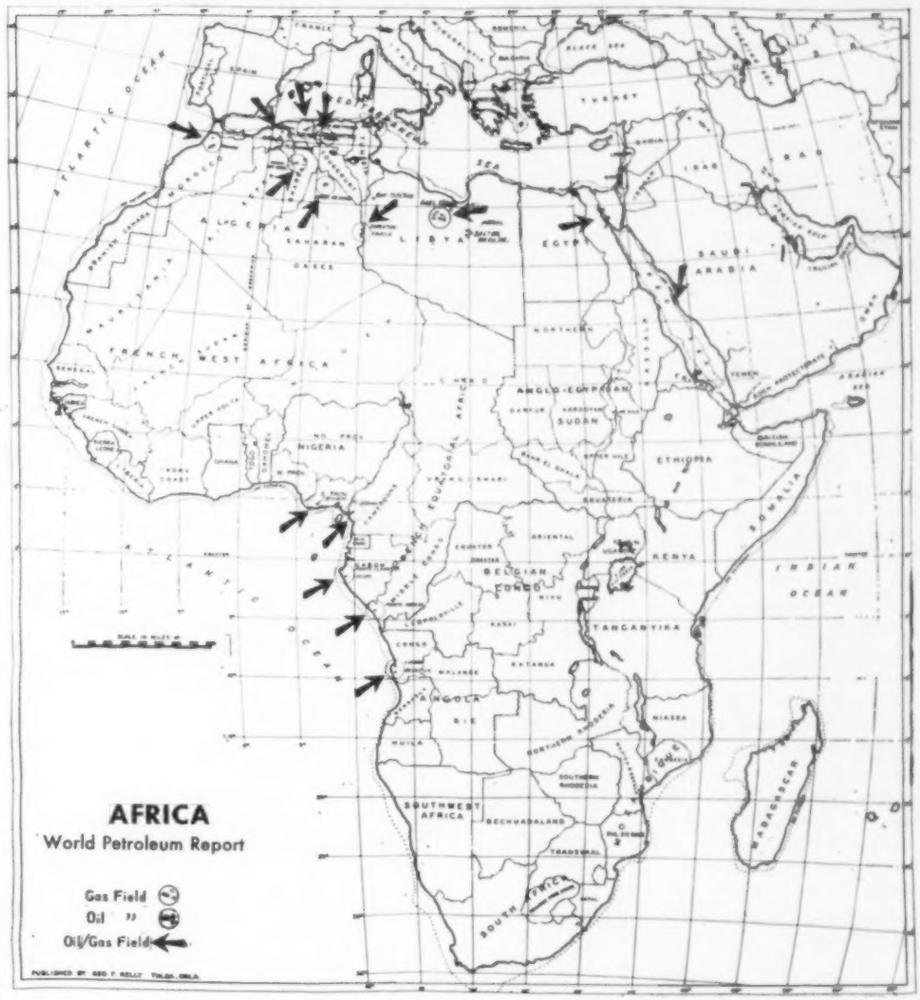
The origins of the oil search were laid by the French who, in a concerted effort to find new reserves within the franc zone, began intensive exploration of what was then southern Algeria, now part of the OCRS. In December 1955, the first oil discovery was made in Algeria at Edjélé (sometimes spelled Edjeleh). It was followed almost exactly two years later, in December 1957, with the first oil discovery in Libya, at Atshan 2 by Esso Standard of Libya.

These two areas are now the focal point for the world's most intensive oil search, and it appears beyond doubt that discoveries to date are of major proportions.

During 1959 another region was added to the oil play, that of the Spanish Sahara. Intensive surface and seismic work began during early 1960. Drilling is not expected until late 1960 or 1961.

A total of 81 rigs was drilling at the beginning of 1960, with 46 rotary rigs (of which 20 were exploratory and 26 development) running in the French Sahara; 24 in Libya; three running in Morocco; and eight in Egypt.

During 1959 no discoveries of major importance were made in Egypt, Algeria, nor Morocco, although small finds were made in each of those countries. Libya had the largest oil find of 1959 and the largest initial discovery which Standard Oil has ever made, the Zelten field in central Libya. A number of other companies had what may be major finds in Libya as well, including Oasis, Gulf, Mobil, and Shell.



PRODUCTION: Oil production in North Africa rose very rapidly in 1959, to 77,230 b/d, and will rise even more steeply in 1960 and subsequent years as pipelines are completed. Libya produced no oil in 1959 other than that run for flow tests of new finds. Algeria rose steeply at the last of the year, when the new oil pipeline to Bougie from Hassi Messaoud was completed.

Production from Algeria is estimated by French sources to rise to 1,000,000 b/d by 1965. In 1960 it is expected to rise to about 160,000 b/d. Libya will complete its first pipeline during 1961, and is expected not to lag far behind the French development, although actual production levels are not predictable at this time. Egypt will increase slightly over its present level, according to present estimates, and Morocco will remain static. This will give an estimated level of 221,000 b/d for total North Africa during 1960.

REFINING: There are four refineries in North Africa now: three in Egypt and one in Morocco. Total capacity is about 78,200 b/d. However, five major new refineries are under consideration. In Morocco, ENI is committed to build a new 20,000 b/d plant with the government. A number of companies, including ENI and some of the major oil companies, have offered to build a new refinery in Tunisia at the terminus of the pipeline under construction from CREPS' Edjélé field. Algeria has plans for a new plant to be built by a consortium of companies; Libya has a new plant planned for construction soon by a major company, and negotiations are under way for a second refinery there if discoveries prove as bright as they now seem. Present refining capacity will be more than tripled on completion of these new projects.

MARKETING: At the heart of North Africa's phenomenal oil development is the marketing advantage afforded by geography. The French government determined long ago that the French would never again be at the mercy of the Suez Canal or Texas, and set out deliberately to diversify sources of crude-oil supply. Libya, too, has the advantage of being next to the rich European crude market, with a substantial transportation advantage over Middle Eastern crude supplies. With the world awash in a surplus of crude, the new discoveries seem unnecessary; but, from the French viewpoint, they are a blessing, especially since the French deficit in international trade over the past 10 years has been approximately equal to her imports of petroleum. New supplies within the franc zone will relieve that exchange need.

The future of North African crude seems bound to European markets, but some of it may flow to the rest of Africa and even to the United States as well, under a system of "crude swaps." These would come about due to the light nature of the Saharan crude, which yields a range of refined products less suitable to the predominately fuel-oil consuming markets of Europe than are the crudes of Venezuela or the Middle East. Under this system, companies in North Africa would undertake to use a certain amount of French Saharan crude somewhere within their international operations outside of France, bringing an equal quantity of Middle Eastern crude to their French markets. This has the happy aspect of providing a market for

French Saharan crudes; at the same time French refineries will be given an accustomed diet of heavier crudes for which they were originally constructed.

For an analysis of the potential markets in Europe, the tables given under the WORLD section (Marketing) should be consulted. They show the potential and expected growth of oil use in Europe.

OIL LAWS

During 1959 the oil laws of North Africa were published in an unusually complete series of volumes containing a word-for-word translation of all the applicable laws. The volumes are known as *"North Africa—Basic Oil Laws and Concession Contracts."* They contain all the applicable laws of Morocco, Algeria, Tunisia, Libya, and Egypt, with the major concession contracts in those areas. It is a highly recommended series. For further information concerning it, the publisher should be contacted: *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.* The same publisher produces a series of volumes on other areas of the world as well. So far as is known, this is the only source for this type of material.

Major revisions were made in the laws of Algeria, and major changes in concession policy as regards new grants were made in Libya. No changes of note were made in Morocco, and none in Egypt—although there are believed to be changes pending regarding concession grants in the latter's Western Desert area (which becomes more attractive as Libya's discoveries trend eastward). For a discussion of changes in the Spanish Sahara, which lies somewhat outside the North African area, see that section.

NATIONAL FACTORS

The past few years have seen a gradual relaxation of restrictions on investment by international concerns in North Africa. Tunisia, Morocco, Algeria, and Libya all have liberalized exchange regulations or oil laws to facilitate investment.

The political climate remains precarious throughout the area, particularly in Algeria where warfare continues, although outside the oil area. Libya has enacted a law which enforces 51% ownership of companies there by nationals. Although this does not affect oil operations, which are not done through Libyan companies, it has made it difficult for supply and service companies to establish themselves.

ALGERIA (OCRS)

The OCRS, comprising the lower southern portion of what was formerly Algeria, plus related French territories of Niger, Sudan (French West Africa), and Tchad (French Equatorial Africa), is rapidly becoming one of the world's major oil-producing areas. During 1959 no new major discoveries were made; however, there is sufficient oil in fields already discovered to support a high production level for many years to come.

On December 5, 1959, a large pipeline delivering Hassi Messaoud (Saharan) crude to Bougie, on the Mediterranean seacoast, was inaugurated. This was a most important event in the French petroleum industry. The 24-in. line will carry 165,000 b/d in 1960, and will average 240,000 b/d in 1961. In the eastern Sahara, work has begun on a second line, partly across Tunisia, which will carry Saharan oil to the coast from Edjélé, Zarzaitine, and other CREPS fields.

EXPLORATION: While production soared with the opening of the line, more companies, both French and foreign, entered the Saharan hunt for oil in 1959. Société des Pétroles de Valence, British Petroleum French affiliate, spudded its first well. Standard of New Jersey entered the Sahara, through its affiliate Esso Saharienne, in a joint venture: Esso 50%, CFP 35%, Petropar 15%. Socony Mobil Oil Co. also entered the Sahara for the first time late in 1959, and obtained a 25% interest in an important concession on the Tunisian border, during December, in partnership with Cie. d'Exploration Pétrolière and associated companies.

146 billion francs (US $347.6 million) were spent in 1959 in the Sahara, of which about 16% was spent by international companies. Between 1952 and 1960, 600 billion francs (US $1.4 billion) have been spent in the Sahara.

The earliest commercial find dates back to December 1955, in Edjélé, by Compaigne de Réchèrches et d'Exploitation de Pétrole au Sahara (CREPS). This company is owned 51% by the French government company, Régie Autonome des Pétroles; 35% by Royal Dutch/-Shell; and the remainder by four State companies. Since this first discovery, other fields have been found in the same area: Tiguentourine (June 1956), Zarzaitine (February 1958); Ouan Taredert, Ouan Taredjeli, El Adeb Larach, La Reculée. Edjélé and Zarzaitine are under development, while Tiguentourine is a more complex structure. In 1959, development drilling began on El Adeb Larach, Ouan Taredart, and La Reculée.

In addition, oil has been found in Hassi Mazoula, Dome à Collenias, and Ouan Taredjeli. These structures are now under study.

Recoverable reserves in this area are estimated by the company at 150 million tons (1.25 billion barrels).

A gathering center has been built at In Amenas, and will be the departure station of a big pipeline under construction. The pipeline, 785 kilometers long, will cross Tunisia to deliver oil to La Skhirra oil terminal on the Tunisian coast, in the Gulf of Gabes. Work is carried out by Trapsa, a CREPS affiliate; constructor is Bechtel Mediterranean. Capacity will be 7.5 million tons initially, equivalent to about 150,000 b/d.

The largest find in the Sahara is Hassi Messaoud, operated jointly by SN Repal and Compagnie Francaise des Pétroles (Algérie). It began producing from 50 wells in 1959; 15 rigs are at work in the field. Great variation in producing formations is a problem. An attempt at fracturing by CFP (A) in September 1959 has not given any results. The best well yields as much as 18,000 b/d, while many others give only a few hundred. The average is about 2,500 to 3,000 b/d. API gravity is 44. (See *WPR 1959*).

Official estimates of proved recoverable reserves are 500 million tons (about 3.9 billion barrels). At least a full year of production and 20 to 30 more wells are thought to be needed to gather enough information in order to estimate total and recoverable reserves.

The two operating companies have formed a joint company, Société Pétrolière de Gérance (SOPEG), for building the pipeline and production units. The first stage was completed in November 1959. A collecting center has been built in Haoud-El-Hamra, to receive crude oil produced separately by SN Repal and CFP (A). This crude oil is sent through the 660-kilometer, 24-in. line to Bougie, where it is loaded on tankers and delivered to French refineries. Production will average 165,000 b/d in 1960 and 240,000 b/d in 1961.

Another find in the Sahara was that of El Gassi, discovered in January 1959 by Société Nationale des Pétroles d'Aquitaine (SNPA). Located 100 kilometers south of Hassi Messaoud, this well yielded 2,500 b/d from the same formations (sandstones of Cambro-Ordovician age). A first stepout, El Gassi No. 2, was dry; and a second, El Agreb No. 1, was a poor producer. The structure seems to be more complex than at Hassi Messaoud, and much faulted. Drilling continues. SN Repal is drilling an El Gassi well on its own permit, on the other side of the border, between two companies.

Bordj Nili No. 2, which found oil north of the wet gas field of Hassi R'Mel, has not as yet proved commercial. A stepout, Nl No. 3, is being drilled.

Natural Gas (see *WPR 1959*): Eight wells now have been completed at Hassi R'Mel structure. A gas line from Hassi R'Mel to La Macta has been approved. This line will be 550 kilometers long, 24 in. in diameter. GREP, the company which built the southern part of the Hassi Messaoud pipeline, has started work on its own part, 325 kilometers in length. The northern part of the line will probably be built by Socoman. Completion of the line is expected the beginning of 1961. The line will be operated by a company formed by the producers, SN Repal and CFP (A), 65%; and 35% by Electricité et Gaz d'Algérie. Installations will cost over 30 billion francs (US $71 million). Gas

ALGERIA (Including OCRS)—Total Number of Wells In Each Field by Creps
(End of 1959)

Field	Wells	Producing Wells
Edjélé	80	75
Zarzaitine	52	49
Tiguentourine	16	15
Ouan Taredert	3	3
El Adeb Larach	3	3
La Reculée	3	1

ALGERIA (Including OCRS)—Number of Wells Completed in 1959 by Creps
(Excluding Exploration)

Field	Wells Drilled
Edjélé	32
Zarzaitine	40
Tiguentourine	1
La Reculée	1
Ouan Taredert	1
El Adeb Larach	2

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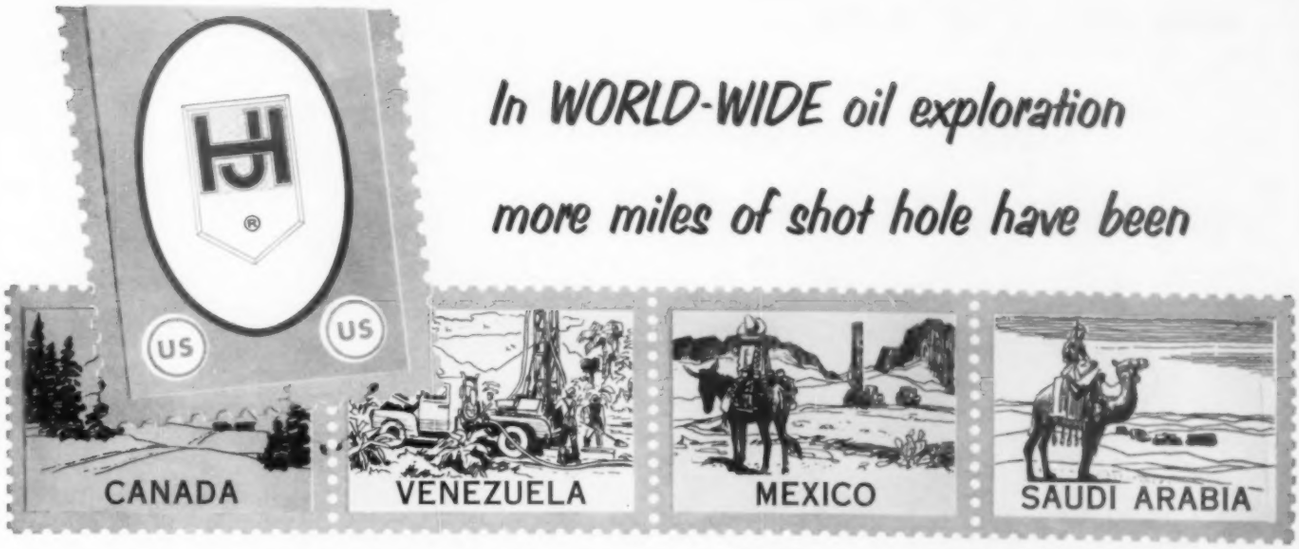

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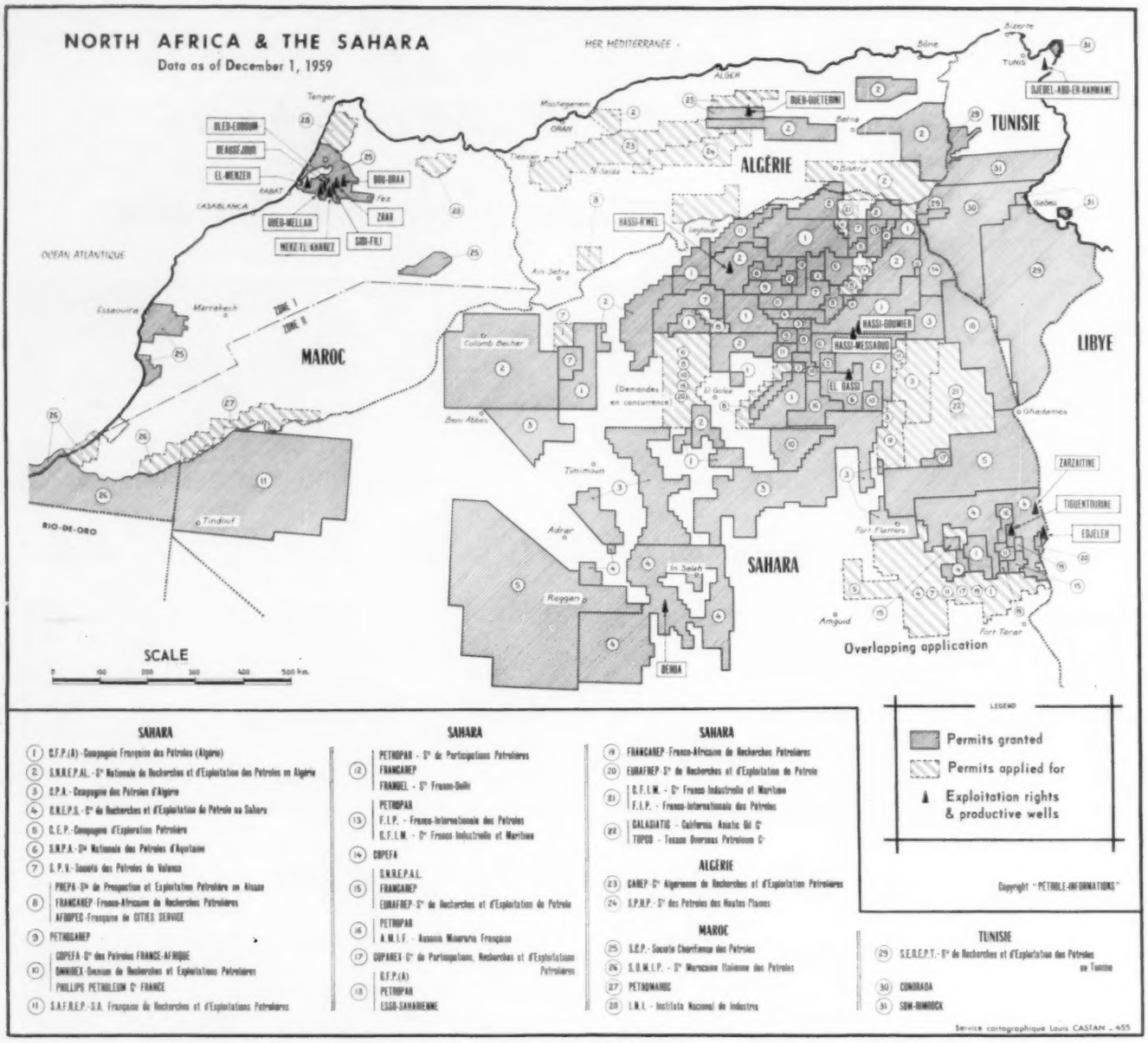

will be sold in Algeria 50% cheaper than present prices: 4.95 francs for ordinary customers, 3.15 francs for priviledged customers. This last price might be reduced for the steel industry.

Reserves of the Hassi R'Mel wet gas have been estimated at 800 billion cubic meters. Gas is also abundant in the Hassi Messaoud field, but there is no plan to use it at present. The French government and private companies are studying the possibility of a submarine line from Algeria to Spain, and then to the rest of Europe, to market the enormous quantities of gas found in the Sahara. The project seems feasible, and one day will supply a part of Europe's energy needs.

PRODUCTION: Production from Hassi Messaoud oilfield started in December 1957, through a small 6-in. pipeline to Touggourt. From there, oil was taken by train to Phillippeville. Total production from December 1957 to October 1959 reached 1,160,477 cubic meters. In the first 11 months of 1959, 800,000 tons were delivered to the coast. In 1960, a total production of 8.9 million tons (160,000 b/d) is expected. In the eastern zone (Edjélé-Zarzaitine-Tiguentourine), no production has taken place as yet, except for local use. Production on a large scale should begin in October 1960, with the opening of the pipeline.

The oldest oil field in Algeria, Oued Gueterini, is about exhausted. It produced 3,500 tons in 1959.

Future Saharan production, according to the Bureau de Réchèrches du Pétrole, will be as follows:

	Barrels Per Day
1960	175,000
1961	320,000
1962	360,000
1963	400,000

These figures take into account only Hassi Messaoud, Edjélé, and Zarzaitine.

TRANSPORTATION: One large pipeline system of 22 in. to 24 in. in diameter has been operating since December 5, 1959. Stretching from Hassi Messaoud to Bougie, it covers 660 kilometers. It will carry 165,000 b/d in 1960, 240,000 b/d in 1962, and 280,000 b/d in 1963.

French sources expect 175,000 b/d to arrive at the Mediterranean coast in 1960. In the last three months of 1960, a second line, that of Edjélé-In Amenas to La Skhirra, should operate at the rate of 150,000 b/d, to reach eventually 240,000 b/d if new discoveries permit. This line was started, November 2, 1959. In the eastern fields, a network of flow lines, tanks, and producing units has been completed.

REFINING: There are no refineries in the OCRS or Algeria as yet, although a new plant at Maison Carrée by a seven-company consortium is planned. A small plant in Algeria was once contemplated and some of the equipment actually arrived; however, it was never installed.

OIL LAWS

The OCRS is subject to a separate law which

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differs considerably from the law of metropolitan France. The principal laws are those of November 22, 1958 (as listed and summarized in *World Petroleum Report 1959*, p. 109). However, there are a number of important subsidiary decrees and ordinances which also affect operations. These include tax legislation and such laws as those establishing the OCRS itself. All these have been collected and translated, along with the principal laws, in an unusual new publication entitled *"North Africa—Basic Oil Laws and Concession Contracts."* The list of laws included in that publication is too long to set out here, but the publication itself includes the text of the Tunisian laws and the concession granted in Tunisia; the Moroccan laws; the Libyan oil law and subsequent decrees; and the Egyptian Law No. 66. It is a most unusual and highly recommended publication. For information concerning it, the publisher should be contacted at *Petroleum Legislation, Ltd., P.O. Box 1591, Grand Central Station, New York 20, N. Y.*

During 1959 important additions were made to the Code Petrolier de l'ORCS. The most important was a decree dated November 22, 1959 (it should not be confused with the law itself, dated November 22, 1958).

An ordinance of April 27, 1959, concerned temporary authorization of exploitation, and a decree of October 1959 gave details concerning taxes.

The decree of November 22, 1959, makes a clear distinction between the holder of an authorization of reconnaissance and a "Permit H." Should the latter be hampered by the former, an appeal may be made to the General Delegate (of the French government in Algeria) in order to obtain right of priority. This confirms the right of priority of "Permit H" over the authorization. Art. 2 of the decree lists once and for all the basic information requested from an applicant. Concerning pipeline transportation, the decree makes it clear that the right of transportation can be transferred to an affiliate (or other) company.

The "Model Convention" foreseen in the law is still in its formative stages. This Model Convention will replace the old "Cahier des Charges," and is one of the more uncertain elements of the new OCRS law. The concessionaire is obligated to have a model convention with his exploitation concession; but, when exploring, he has his choice, and may elect (1) to take the model convention existing as of the date of issue of his exploration permit; or (2) he may wait until the exploitation concession is granted and receive whatever model convention is in effect at that time. If his exploration permit is renewed, he must once again make the same choice, using the model convention which is in force as of the date of renewal.

The OCRS law may be extended to other African territories of the French community, provided tax provisions can be adjusted. The exploration agreement concluded between Jersey Standard, Cie. Française des Pétroles, and Petropar (both the latter are majority owned by the French government) covers the "Erg Oriental" (Permit No. S. 102 on BRP maps), some 20,000 square kilometers along the Tunisian border. Participation is 50% Esso Saharienne (Jersey's affiliate), 35% CFP (A), and 15% Petropar. Conduct of operations on the permit is to be directed by a management committee formed by both groups, with representatives to meet in Paris under a French chairman. Jersey Standard is to manage operations during the first five years. Minimum investment is to be fixed by common agreement between the companies and the government. Government approval of the contract was received in 1959.

NATIONAL FACTORS

The political future of the country is not clear. Although troubles in Algeria have never reached the Sahara itself, the pipelines carrying Saharan oil have to cross Algerian territory, part of which is still in turmoil.

On September 16, 1959, General DeGaulle offered Algerians "self-determination" four years, at the latest, after the end of fighting. The so-called provisional government of the Algerian republic has declined to go to Paris to discuss a truce. The rebels want to negotiate with French authorities the political future of Algeria, while the French government insists on discussing such future with elected representatives of the Algerian people. On November 10, DeGaulle once more offered the Algerian government members to come to Paris to negotiate the conditions of an armistice without discussing political issues, which are to be left to elections. This last offer met with an answer from the Algerian rebels telling the French government to negotiate with the rebel chiefs who are in French jails.

It is more and more obvious that the French government, in all its acts, separates the future of the Sahara from that of Algeria. While the 12 departments of Algeria are administered from Algiers through a general delegate of the government, the Sahara is administered from Paris through a minister who bears the title "Delegate of the Prime Minister." Economically, the Algerian part of the Sahara is part of the Common Organization for the Saharan Region.

TUNISIA

EXPLORATION: The only exploring companies are Rimrock, Conorada, and SEREPT. For a map of their holding, see *World Petroleum Report 1959*, p. 119. During 1959 Socony Mobil acquired a 50% interest in SEREPT's holdings. Rimrock's situation is precarious, since its Israeli activities are not very compatible with Arab operations (see *WPR 1959*).

Conorada Petroleum Corp., jointly owned subsidiary of Ohio Oil, Amerada, and Continental companies in the United States, has not yet reached the drilling stage. Seismograph work was begun late in 1959, south of the Chott Djerid salt flat.

SEREPT (Soc. de Réchèrches et d'Exploitation des Pétroles en Tunisie) has drilled a number of dry holes, many of them with oil shows; but none has been a commercial find—although one was rumored to be during late 1959.

Total footage drilled by SEREPT through November 1, 1959, was 22,284. Drilling was concentrated in the extreme south of Tunisia, where three deep wells were completed: Mechiguig region (MG.1), spudded in July 1958, reached a total depth of 12,336 ft in the Gothlandian in April 1959. Oued Siah Es Seraia (OS.1), spudded in September 1958, reached a total depth of 7,214 ft (to the basement) in February 1959. Djebel Melab (MA.1), spudded in March 1959, reached a total depth of 7,477 ft in the Upper Carboniferous in September 1959. Kraoui El Kouif (Kf.1), spudded in April 1959, reached a total depth of 4,423 ft in the Gothlandian in April 1959. Bir Tartar (Tt.1), spudded in July 1959, reached on November 1, 1959, 6,037 ft in the Cambrian, and is still drilling.

SEREPT had two geophysical crews working during the year: A refraction crew ran 808 miles of profile, and a reflection crew ran 373 miles of profile.

Production from the Cap Bon gas field rose to 177,865,664 cubic feet daily, and gasoline production for the first 10 months reached 323,100 US gallons. Repressuring of the gas field has been in operation since December 1958.

PRODUCTION, REFINING: There is no crude production, and no refining. All consumption is imported, mostly from France, as shown in the accompanying table.

TRANSPORTATION: GREP, the Entrepose Co., and the Ste. Parisienne pour l'Industrie Electrique are jointly engaged in building a 24-in. oil pipeline 476 miles long from Oekhira, Tunisia, to Edjélé, Algiers. Initial equipment shipments have been made by the M. J. Cross Manufacturing Co., of Tulsa.

TUNISIA—Oil Imports 1958

(Metric Tons)

Product	Origin		Total
	France	Other	
Gasoline and "super" gasoline	70,650	—	70,650
Kerosine	36,600	—	36,600
Gas oil	97,500	1,900	99,400
Aviation gasoline	—	1,500	1,500
Heavy fuel oil	60,600	34,900	95,500
Diesel	—	—	—

OIL LAWS

An unusual and highly recommended publication appeared for the first time in 1959. Known as *"North Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* it contains the original texts, in excellent and reliable English translation, of Tunisian legislation and concession contracts of principal explorers. It also contains the translated OCRS laws, as well as laws for Egypt and Morocco. It is kept current by regular supplements to the original volumes, keeping the collection complete. For information concerning it, contact the publisher: *Petroleum Legislation Ltd., Post Office Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be sent directly to that address.

No new legislation was passed in 1959. For a review of the 1958 oil law and its regulations, see *World Petroleum Report 1958*.

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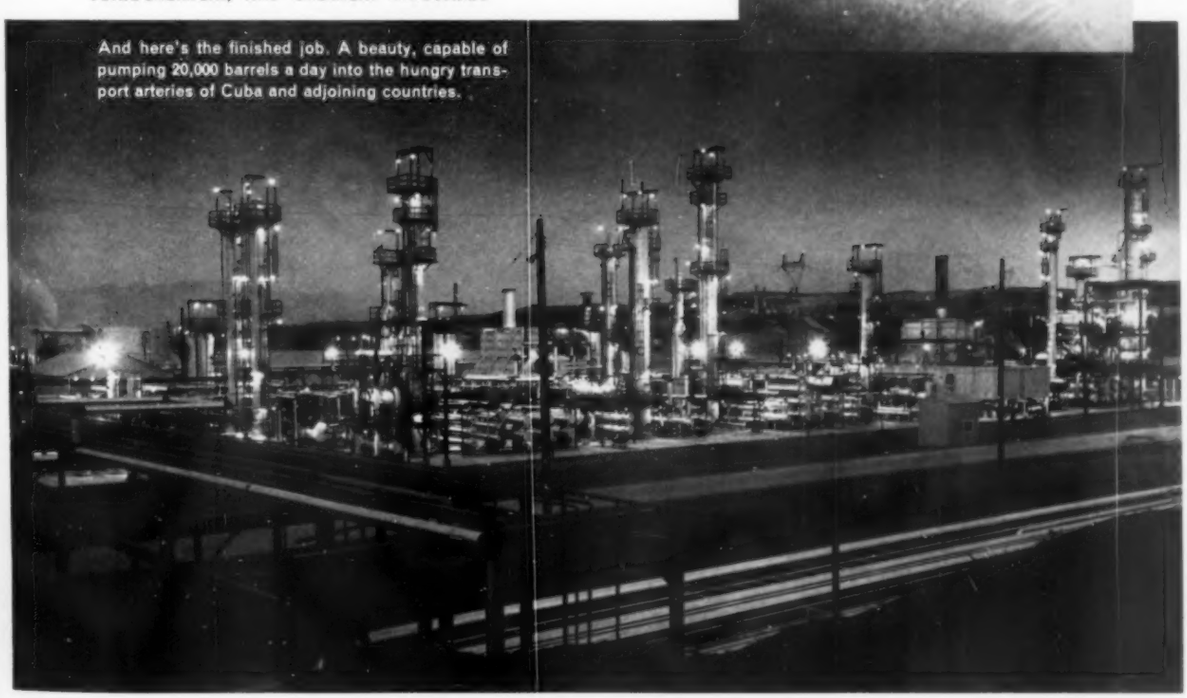

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MOROCCO

EXPLORATION: No major strikes were made in 1959, but some exploratory drillling was done by Ste. Chérifiènne des Pétroles (SCP), as shown in an accompanying table. Exploration by Ambassador, ENI, and other concession holders (see map in *WPR 1959*, P. 116) has not yet begun. A French company, PROMIRIP, with Wintershall of Germany and United States Exploration Co. of the USA, have applied for permits.

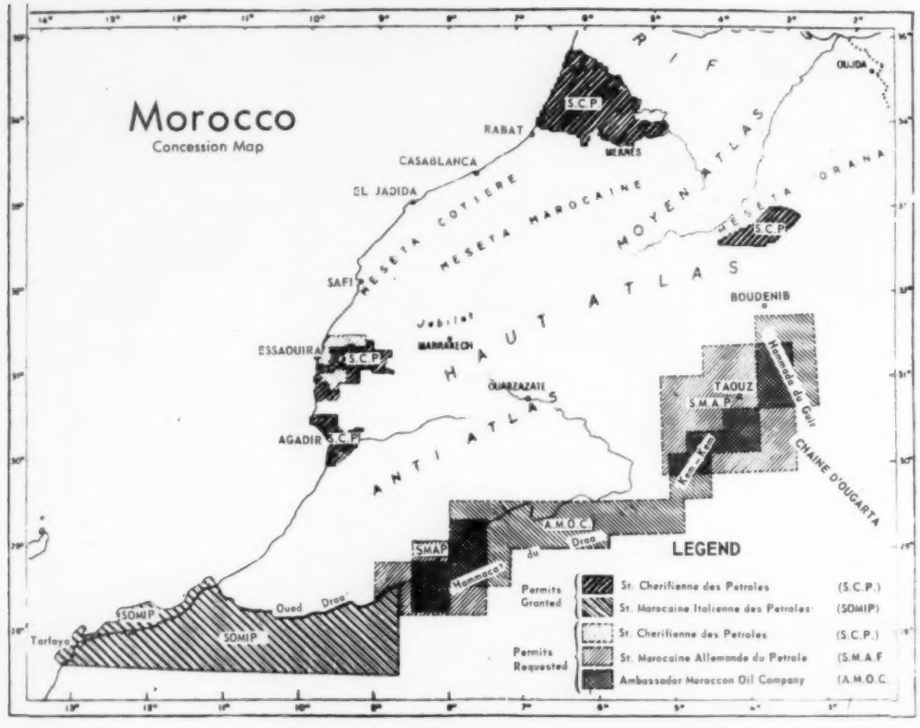
First oil shows on the disputed Moroccan-Algerian frontier were found in early 1959 at M'Hammid Oasis in two wells drilled for water by Bureau de Réchèrches et de Participations Minières (50-50 Moroccan and French government). The latter has applied for rights on 200 square miles in the area.

PRODUCTION: The small deposits of the Rharb region, exploited during 1941-45, produced 30,000 tons of crude oil during that period. Production of the Oued Beth wells rose to 118,000 tons in 1954 from 40,000 tons in 1950. These wells have furnished an average 90,000 tons of petroleum per year since 1950. In the Haricha field, the average daily production of the three productive wells (out of eight wells drilled) is about 16.5% of the Ste. Chérifiènne des Pétroles total production.

Crude-oil production in 1959 averaged 1,800 b/d.

MOROCCO—Drilling History
(Millions of Feet)

1956-57	97.6
1955-56	101.6
1954-55	193.3
1953-54	253.2
1952-53	272.8
1951-52	299.1
1950-51	309.8
1939-50	255.7
1929-39	192.9



REFINING: There is only one refinery, a small 2,100 b/d plant with 1,800 b/d cracking capacity at Petijean.

SAMIR (Ste. Marocaine-Italiènne de Reffinage), a joint company founded by ENI and the Moroccan government, will build a 30,000 b/d refinery to supply the Moroccan market, under a 1959 agreement. The project will require an investment of 10 billion lire (about US $16 million). Protectionist duties will be applied on eventual oil imports to favor the new plant. SAIPEM company of the ENI group will design the plant; and Nuovo Pignone, another affiliate, will build it.

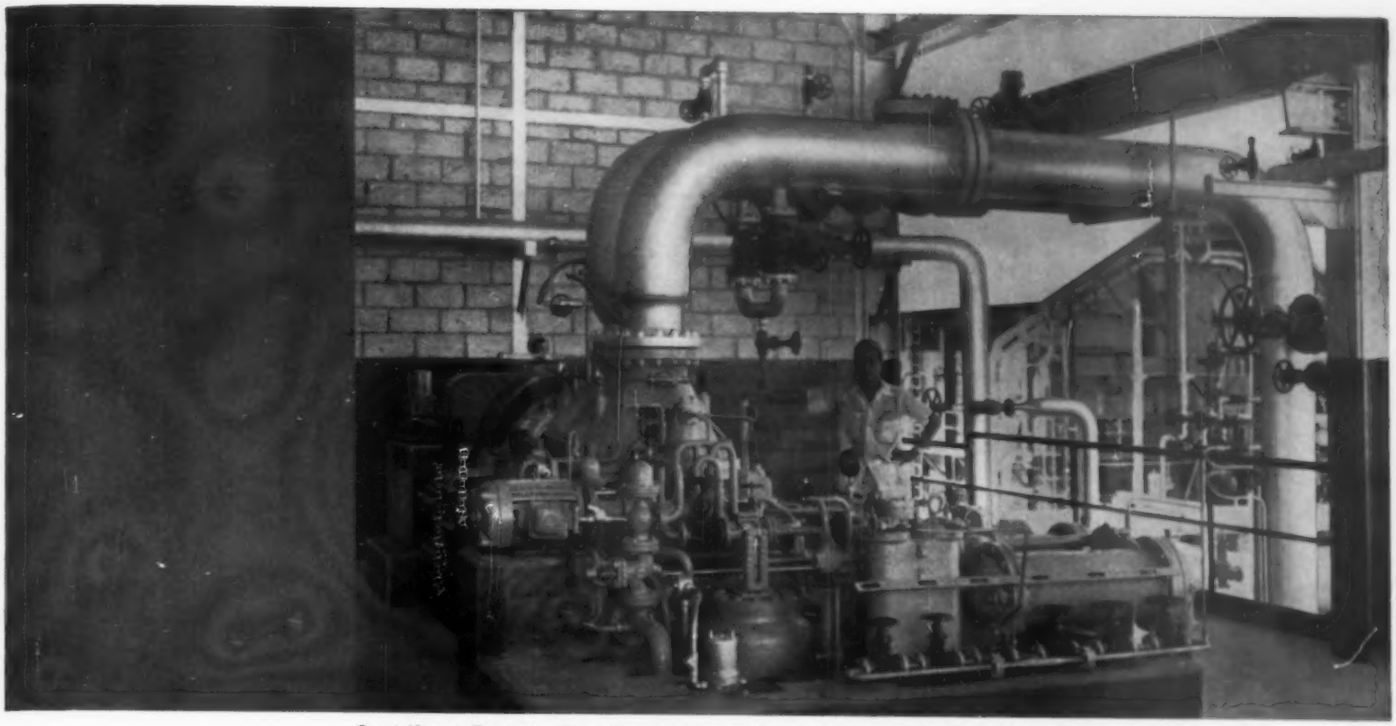
OIL LAWS

During 1959, the oil law and its regulations in Morocco were published in a new English translation, along with the oil laws of Algeria, Egypt, Tunisia, and Libya, in a new publication, known as *"North Africa—Basic Oil Laws and Concession Contracts (Original Texts),"* which is most unusual, and is highly recommended. The initial set of volumes is kept up to date with supplements which keep this collection current. It is available through its publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

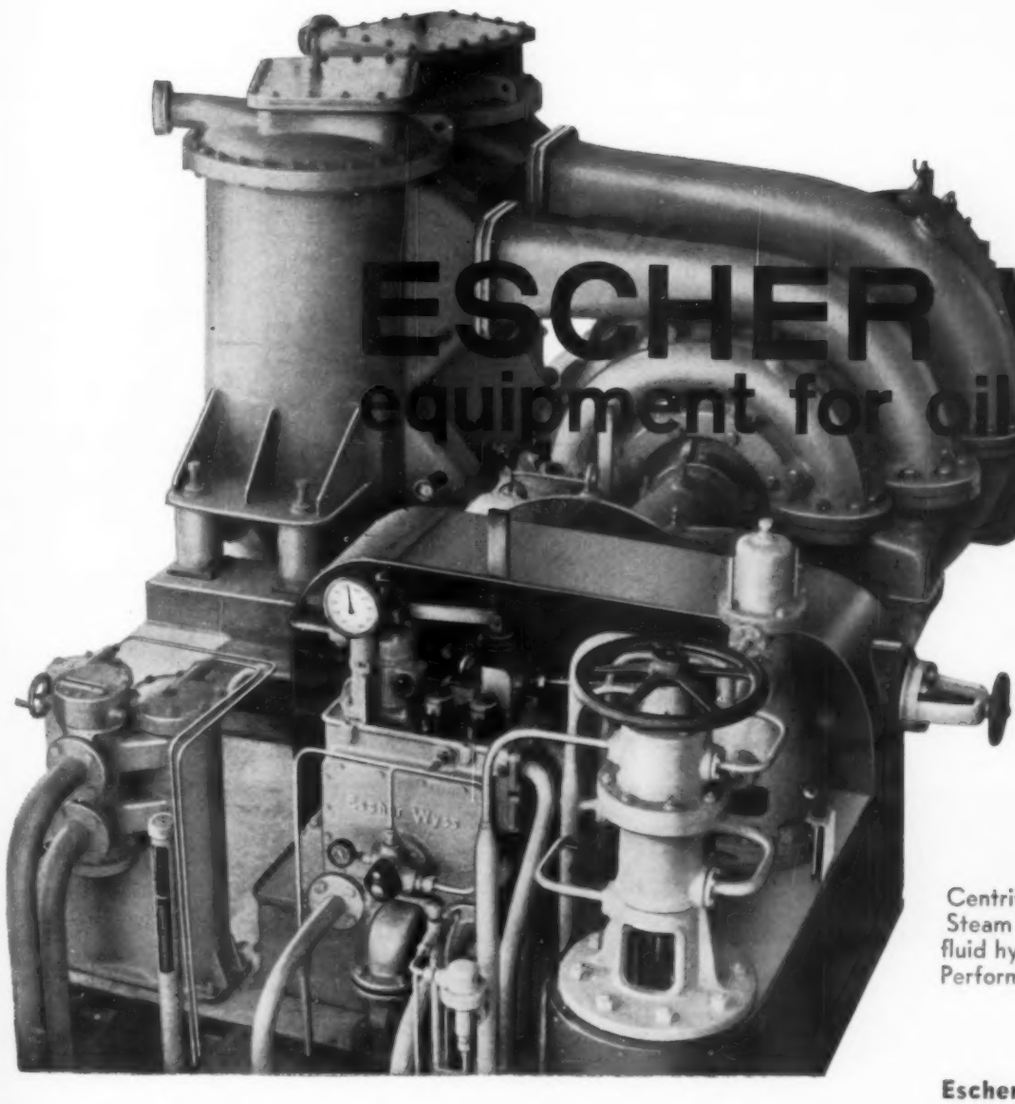
MOROCCO—Wells Drilled in 1959 through October 1 and Planned through December 31
(Depth in Meters)

LOCATION	Well		Depth on 1-1-59	Final Depth	Bottom Formation	Results	Depth on 10-1-59	Planned Wells from 10-1-59 to 1-1-60	Wells Drilled as of 10-1-59	Productive Wells	Total Drilling to 10-1-59
					EXPLORATION						
	Haricha	HR 18	509.2	1,382.3	Dogger	Dry					
Rharb	Haricha	HR 18 bis*		993.5	Dogger	Oil			3	1	3,258.3
	Haricha Sud	HS 2		1,916.7	Dogger	Dry					
	Guetata	GT 1	1,751.6	2,023.2	Trias	Dry	1,628.5				
S-W Marocain	Bou Zergoun	BZ 1							1		271.6
					EXTENSION						
	Haricha	HR 13 bis	288.7	1,000.0	Dogger	Oil					
	Haricha	HR 22		1,155.2	Dogger	Dry					
	Haricha	HR 22 bis*		916.1	Burdigalien	Dry					
Rharb	Haricha	HR 22 ter*		957.0	Burdigalien	Oil			4	2	3,040.1
	Haricha	HR 19						HR 19			
	Haricha	HR 27						HR 27			
	Kechoula	KE 4		1,608.0	Oxfordien	Dry					
S-W Marocain	Jeer	JR 3		1,675.2	Callovien	Dry			3	1	4,811.2
	Jeer	JR 4		1,528.0	Oxfordien	Gas					
					EXPLOITATION						
	Haricha	HR 20		876.5	Burdigalien	Dry					
	Haricha	HR 20 bis*		937.3	Burdigalien	Oil					
	Haricha	HR 21		1,001.2	Burdigalien	Dry					
	Haricha	HR 21 bis*		1,075.6	Dogger	Oil					
Rharb	Haricha	HR 26		1,079.0	Dogger	Oil			5	3	3,676.7
	Haricha	HR 23					880.0				
	Haricha	HR 24					923.0				
	Haricha	HR 29						HR 29			
Total									16	7	15,057.9

*Directionally drilled from wells HR 18—HR 22—HR 20 and HR 21.



Centrifugal Recycle Gas Compressor with sealing oil system, installed in an oil refinery



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Centrifugal Compressor with Condensing Steam Turbine, supplying combustion air to a fluid hydroformer installed in an oil refinery. Performance: 11,250 cfm, 260 psia, 8150 rpm

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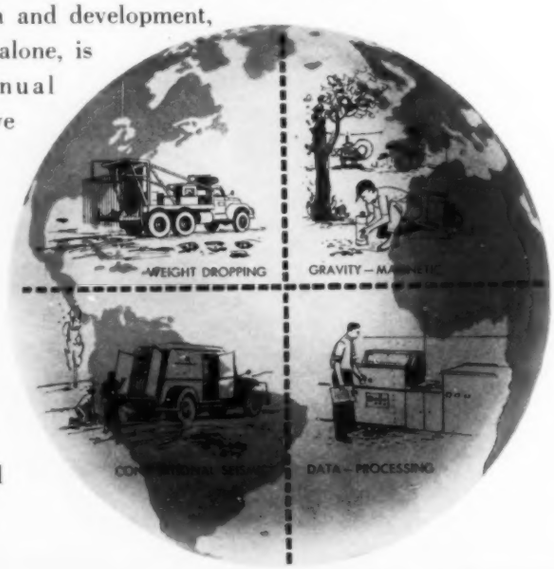


ROBERT H. RAY GEOPHYSICAL COMPANIES

LIBYA

EXPLORATION: The outstanding single development of the international petroleum industry during 1959 was the emergence of Libya as one of the world's great oil countries, although hardly a barrel of oil has left the country. In the short space of less than three years since passage of the oil law in 1955, Libya came from a completely untested and little-valued country for oil with no activity to speak of to the end of 1959 when 65% of the country was under concession, 17 companies were operating, including all the world's largest, employing 24 geological parties, 31 geophysical crews and 23 rigs. About three quarters of the country has already been mapped and photographed from the air, 63 wells had been drilled, including 15 producers. Twenty three more wells were drilling or rigging up at the years end.

Discoveries have been made by Esso (Jersey Standard), Mobil Oil, American Overseas (Caltex Group), Gulf, Oasis Oil (operator for Continental, Amerada and Ohio), Shell and Libyan American (Texas Gulf). The country's reserves are estimated in very preliminary fashion at around 50 billion barrels in the Sirte basin alone, about half of them recoverable.

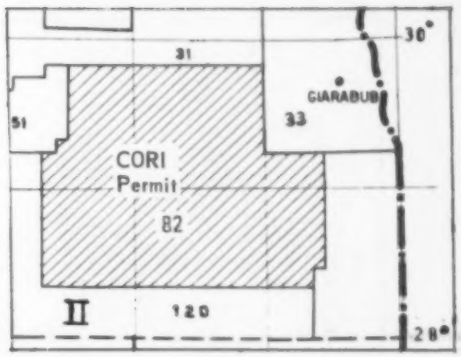
The year's surprise came when ENI, the Italian government's company, was granted a concession through CORI, its Libyan affiliate. The oil law gives priority to the first applicant, which CORI was not but all the other applicants were declared ineligible. One company, Hunt International, planned to appeal the award to the Supreme Court claiming it was not ineligible when the award was made. The concession involved (see map) is a particularly tempting one on the "fairway," east of Zelten.

Direct word by Anis Qasem, member and adviser of the Petroleum Commission, states that the new concession granted to CORI, affiliate of AGIP Mineraria, "provides for payment of a 17% royalty, surrender of the percentage depletion allowance and, after the discovery of oil in commercial quantities, an option to the Government to participate to the extent of 30% in the search for, exploitation, development, transportation within Libya and marketing of the oil. Should CORI decide to commence other petroleum operations, such as refining, the government shall have the right to participate in such operations to no less than 30%. The government will be represented on both the Board of Directors and the Board of Controllers. Expenditures incurred prior to the participation of the government will be recovered in the normal way and the government's rights under the petroleum Law are not affected."

LIBYA—Exploratory Wells

(By Caltex Group, as of Nov. 18, 1959)

Well	Location	Date of Completion	Total Depth	Result
Gebel Uaddan A1-44	135 miles s. of Sirte	11-18-58	3569'	Abandoned dry hole
Scelua A1-43	65 miles s.w. of Sirte	5- 2-59	7606'	Suspended
Resen A1-73	83 miles s.w. of Sebha	8-18-59	6767'	Abandoned dry hole
Beda B1-47	265 miles s. of Benghazi	9-26-59	5107'	Discovery



Most spectacular to date is the Zelten discovery of Esso, evidently a major oil find. The second stepout in August 1959 was drilled 4.5 miles southwest of the original discovery. It came in a 15,000 b/d producer, similar to the first well which tested 17,500 b/d, producing from the Paleocene (same as the discovery well). Depth of pay is 5,770 ft to 5,915 ft. The well was carried down farther, to water at least, but not to basement. Total pay is estimated at 296 ft.

A third test, about 4½miles from No. 2, was dry at the original producing horizon, but on continuing the well down a second producing zone was found. Zelten 3 yielded 100 bbls/hour on a 22 hour drill-stem test of a 45-ft limestone section topped at 7,166 ft. A fourth well was drilled using the rig that drilled a dry hole on concession 6 earlier in the yard. The four wells make a type of quadrilateral. No. 4 was expected to top the Paleocene at around 5,415 ft. Esso plans a $100 million investment in a pipeline, refinery, and marine terminal. Rough reserve estimates are 10 to 11 billion barrels, one of the world's largest fields.

Esso is considering declaration of its new find as a "commercial discovery." This would entail taking out Libya's first exploitation concession; and, under Libyan law, the exploitation rentals are high and cover the entire area—not just the discovered structure.

Estimates of oil in place in Zelten field range from 50,000 bbl to 100,000 bbl per acre-foot. The structure trends northwest-southeast, and is almost parallel with the Coast., leaning slightly north. An estimate as to size is difficult, due to seismic interpretation difficulties in the limestone. Oil produced so far is sweet, with only 0.013% sulfur content. API gravity is 37 deg.

Gulf Oil of Libya completed a wildcat 200 miles south of Tripoli in 1959. Emgayet No. 1 flowed 876 b/d of 35-gravity clean oil from 4,100 ft. The company has had oil shows in several of its other wells.

Shell made an encouraging discovery early in 1959 on its Bir Tlacsm concession, near the Tunesian border. The well tested 700 b/d of 44 API gravity oil from the 8,882 to 8,976 ft interval. Total depth was 13,187 ft. A second well is drilling 6 kilometers away.

Socony Mobil announced an oil discovery in Eastern Libya, about 100 miles from the Mediteranean coast, during late 1959. The wildcat well, Amal One flowed 865 bbls 34 gravity oil in a 24-hour preliminary test between 9,841 and 10,045 ft. Mobil holds 75% and Gelsenberg interests of Germany hold 25%.

BP Exploration Co. spudded during October about 120 miles south-west of Tobruk. BP Exploration Co. has previously drilled three dry test wells in Libya.

American Overseas Petroleum Ltd., exploration and producing company of the Caltex Group, in November completed its Beda B-1-47 discovery well in Libya. On flow tests through tubing the well produced 3,650 b/d of 36.6 degree API gravity oil. Drilled to a total depth of 5,107 ft and plugged back to 4,110 ft., Beda B-1 is in petroleum concession 47. The discovery is large, and the structure extends across into Oasis's Concession No. 59. Oasis has already

(*Continued*)

PRINCIPAL LIBYAN OIL DISCOVERIES

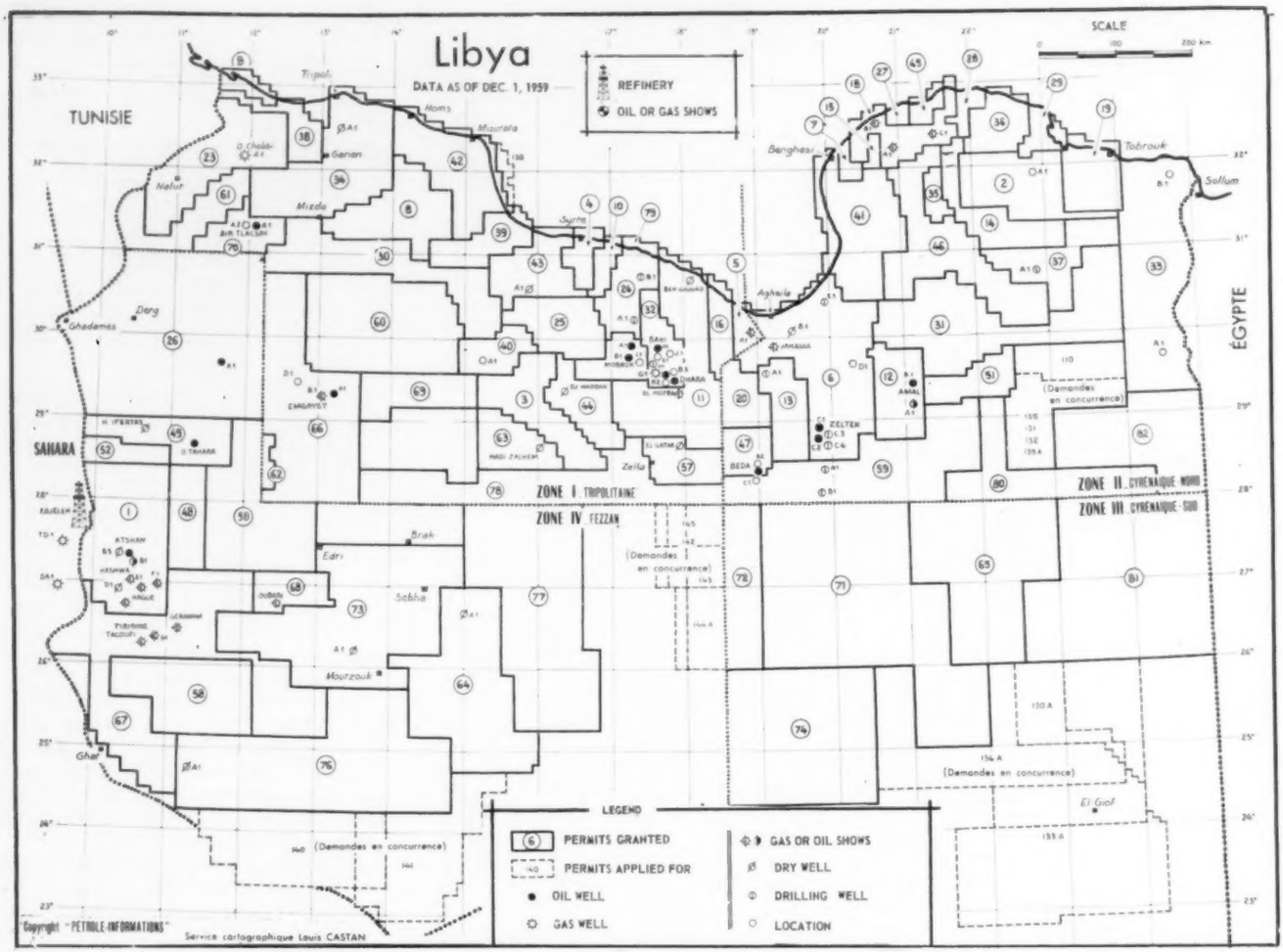
Company	Block	Well	Depth (ft.)	Capacity B/D	API
Oasis	32	Bahi A-1	6,100	800	40
Oasis	32	Dahra B-1	4,940	800	46
Oasis	32	F-1-32	4,600	800	
Oasis	32	B-3-32	4,567	400	
Oasis	26	A-1-26	5,700	"Substantial show"	
Oasis	32	F-2	3,100	8,000	40-37
Shell	70	Bir-Tlacsin	8,976	700	44
Gulf	66	Em-Gayet	4,100	750	35
Libyan-American	17	Mabruk	5,700	1,200	40
Libyan-American	17	Zahalin	9,228	900	39
Esso-Libya	6	Zelten 1	5,670	17,500	37
Esso-Libya	6	Zelten 2	5,850	15,000	37
Esso-Libya	6	Zelten 3	7,657		
Amoseas	47	Beda B-1	5,107	3,650	36
Mobil Oil	12	El-Amal B-1	11,290	865	35

LIBYA—EXPLORATION WELLS

(By Oasis Oil Co., owned by Continental, Amerada, and Ohio Oil companies)
—(As of September 1959)—

Name of Well	Location	Status	Total Depth (Feet)
A-1-26	29° 39' 30" N 11° 38' 43" E	Coring at 2,714 ft	
A-1-32	29° 52' 07" N 17° 35' 04" E	Oil well	6,100
B-1-32	29° 31' 06" N 17° 46' 05" E	Oil well	4,940 TD 3,805 PBTD
B-2-32	29° 28' 09" N 17° 47' 20" E	Rigging up	
B-3-32	29° 32' 17" N 17° 50' 23" E	Drilling at 1,835 ft	
C-1-32	29° 36' 17" N 17° 45' 18" E	D & A*	5,125
D-1-32	30° 01' 14" N 17° 33' 14" E	D & A*	8,349
F-1-32	29° 28' 19" N 17° 53' 26" E	Oil well	4,600
G-1-32	29° 32' 10" N 17° 42' 23" E	Gas well	5,228 TD 3,185 PBTD
H-1-32	29° 36' 08" N 17° 35' 12" E	Drilling at 8,156 ft	
A-1-59	28° 24' 17" N 19° 55' 12" E	Coring at 6,763 ft	

*Drilled and abandoned.



LEGEND

Cons No.	Company	Zone	Area Sq Km	Granted
1	Esso Standard (Libya) Inc.	4	20,788	20 Nov. 55
2	Nelson Bunker Hunt	2	11,753	20 Nov. 55
3	Esso Standard (Libya) Inc.	1	10,932	12 Dec. 55
4	" " " "	1	3,087	12 Dec. 55
5	" " " "	1	1,722	12 Dec. 55
6	" " " "	2	25,690	12 Dec. 55
7	" " " "	2	1,310	12 Dec. 55
8	" " " "	1	11,852	12 Dec. 55
9	Mobil Oil of Canda Ltd.	1	2,017	31 Dec. 55
10	" " " " "	1	2,283	31 Dec. 55
11	" " " " "	1	19,004	31 Dec. 55
12	" " " " "	2	8,004	31 Dec. 55
13	" " " " "	2	6,893	31 Dec. 55
14	" " " " "	2	7,818	31 Dec. 55
15	" " " " "	2	797	31 Dec. 55
16	Libyan American Oil Co.	1	3,709	12 Dec. 55
17	" " " "	1	4,476	12 Dec. 55
18	" " " "	2	7,163	12 Dec. 55
19	" " " "	2	7,437	12 Dec. 55
20	" " " "	2	4,708	12 Dec. 55
21	Cancelled			
22	"			
23	Compagnie Francaise Des Petroles	1	14,900	31 Dec. 55
24	" " " "	1	6,214	31 Dec. 55
25	Oasis Oil Company	1	8,374	12 Dec. 55
26	" " "	4	53,572	12 Dec. 55
27	" " "	2	869	12 Dec. 55
28	" " "	2	1,809	12 Dec. 55
29	" " "	2	2,533	12 Dec. 55
30	" " "	1	16,433	12 Dec. 55
31	" " "	2	26,324	12 Dec. 55
32	" " "	1	5,131	12 Dec. 55
33	" " "	2	26,094	12 Dec. 55
34	D'Arcy Exploration (Africa) Ltd.	1	20,086	28 Jan. 56
35	" " " "	2	1,829	28 Jan. 56
36	" " " "	2	5,573	28 Jan. 56
37	" " " "	2	8,842	28 Jan. 56
38	Anglo-Saxon Petrol Co. Ltd.	1	6,079	11 Jan. 56
39	" " " " "	1	6,233	11 Jan. 56
40	" " " " "	1	4,770	11 Jan. 56
41	" " " " "	2	16,132	11 Jan. 56
42	American Overseas	1	13,742	31 Dec. 55
43	" "	1	8,258	31 Dec. 55
44	" "	1	6,885	31 Dec. 55
45	" "	2	1,809	31 Dec. 55
46	" "	2	18,613	31 Dec. 55
47	" "	2	4,144	31 Dec. 55
48	Esso Standard (Libya) Inc.	4	6,823	2 May 56
49	Compagnie Francaise Des Petroles	4	9,720	2 May 56
50	Mobil Oil of Canada Ltd.	4	19,715	2 May 56
51	American Overseas	2	5,374	2 May 56
52	Anglo Saxon Petrol. Co. Ltd.	4	4,295	15 Dec. 56
53	Oasis Oil Company	2	1,012	22 Dec. 56
54	" " " Cancelled	2	1,439	22 Dec. 56
55	" " " June 18, 1957	2	1,737	22 Dec. 56
56	" " "	2	2,113	26 Jan. 57
57	Mobil Oil of Canada Ltd.	1	5,576	26 Jan. 57
58	Esso Standard (Libya) Inc.	4	16,838	11 Dec. 56
59	Oasis Oil Company	2	24,399	22 Dec. 56
60	" " "	1	24,850	26 Jan. 57
61	Compagnie Francaise Des Petroles	1	8,584	4 Mar. 57
62	Mobil Oil of Canada Ltd.	1	1,055	20 Feb. 57
63	D'Arcy Exploration (Africa) Ltd.	1	7,000	11 Jan. 57
64	" " " "	4	29,096	11 Jan. 57
65	Nelson Bunker Hunt	3	32,944	18 Dec. 57
66	Gulf Oil of Libya	1	29,116	8 Apr. 57
67	" " " "	4	41,288	8 Apr. 57
68	" " " "	4	5,046	8 Apr. 57
69	Anglo-Saxon Pet. Co., Ltd.	1	7,837	10 Dec. 57
70	" " " "	1	5,047	10 Dec. 57
71	Amerada (Oasis)	3	60,650	18 Dec. 57
72	Mobil Oil of Canada Ltd.	3	10,997	18 Dec. 57
73	American Overseas	4	40,442	10 Nov. 57
74	Pan American Pet. Corp.	3	37,242	17 Mar. 58
75	" " " " Canc. 5-17-59	4	10,950	17 Mar. 58
76	" " " "	4	44,716	17 Mar. 58
77	Deutsche Erdoel Ag.	4	39,892	14 Aug. 58
78	Gewerkschaft Elwerath	1	20,043	2 June 59
79	Gulf Oil of Libya	1	805	22 Aug. 59
80	D'Arcy Exploration (Africa), Ltd.	2	13,554	5 Sep. 59
81	D'Arcy " " "	3	49,511	5 Sep. 59
82	Cori (ENI)	2	29,996	Nov. 59

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Nov. 59

LIBYA—Exploratory Wells

(By D'Arcy Exploration Co., owned by British Petroleum Co.)
(January through August 1959)

Well	Results	Depth (feet)
A1-64	Dry	5,450
CR1-37	Dry	2,000
CR2-37	Dry	452
CR3-37	Dry	242
CR3A-37		594

staked a location on its end of this same feature, about five miles south of the discovery, since almost 50% of it extends into the Oasis holding.

Oasis Oil Co. of Libya's first wildcat well in Libya resulted in a "promising" discovery 75 miles south of the Gulf of Sirte. Oasis, a wholly owned subsidiary of The Ohio Oil Co. is operator for the three company group of Ohio Oil, Continental Oil Co. and Amerada Petroleum Corp. Each company holds an undivided one third interest. Bahi No. 1, the discovery well located near the center of Block 32, initially tested 75 barrels of 39 degree sweet oil on a two and a half hour drill stem test through a one-quarter inch bottom hole choke. The well was shut in after a series of swabbing tests, indicating a potential of 500 b/d through two inch tubing. The discovery is located on a north-south anticline, a prominent feature of the tract. The interval tested was a 32-foot section between depths of 5,822 and 5,854 ft in Quartzitic sandstone. Coordinates of the well are 29° 52′ 27″ North, 17° 35′ 4″ East.

Oasis drilled a second well, (Dahra B-1-32, 29° 31′ 6″ North, 17° 46′ 5″ East) 25 miles south and east of the Bahi 1 on the same structure, probing for oil in Quartzitic sandstone. It also was a producer.

The company's best find occurred when F2 well in Concession 32 flowed 8,000 b/d of 43 gravity oil from 3,100 ft during mid-December. Another wildcat discovery was made by Oasis on concession 26 in western Libya. The well flowed 40 API gravity oil to the surface in 30 min from the interval between 5,719 ft and 5,740 ft. On prior drill-stem testing from 5,720 ft, 37 API gravity oil rose 2,570 ft in 90 min. Neither test showed any water. The 40 ft of sandstone section is of Mississippian age.

Libyan American has a 1,200 b/d and a 900 b/d find on Block 17. The company found about 90 ft of limestone pay in Mobruk No. 1 on Concession 17 at about 3,000 ft. Esso Sirte has been formed by Jersey Standard to operate the concession jointly with Libyan American and Grace Line interests.

LIBYA—Exploratory Wells

(By Mobil Oil of Canada Ltd., owned by Mobil Oil Co.)
(July 1, 1958, to July 1, 1959)

Well	Total Depth (feet)	Status	Location
El Hofra-1 (A1-11)	8,686	Noncommercial: discontinued	14 mi. SE of Oasis' Dahra
Ben Gaurad-1 (B1-11)	8,840	Dry	17 mi. E of Em Nofilia
Sidre-1	10,500	Dry	38 mi. SSE of Sirte
Amal-1	9,830	Oil shows	

PRODUCTION, REFINING, TRANSPORTATION: There is no production as yet, but Esso is considering a 32-inch line for export, plus a refinery. Brown & Root of Houston have been commissioned to survey two routes, one northwest from Zelten to the coastal town of Agheila, about 100 miles. The alternate is Benghazi, some 200 miles away. Whichever is selected would also be the site of the proposed refinery.

OIL LAWS

During 1959 the oil laws of Libya, including the new Petroleum Royalties Law, were published in a unique and useful collection of North Africa's laws entitled *"North Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* The series contains word-for-word translations of governing oil regulations—the only compilation of its kind to date. The original volumes are kept up to date with supplements containing later laws or concessions. They may be obtained by writing directly to the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

The most recent development has been the Petroleum Royalties Law, passed August 3, 1958, which is of minor importance. It provides for payment, to the province concerned, of income tax collected from oil companies within the administrative borders of each province, along with issuance fees for exploration licenses, and one-third of other fees collected by the State. Of remaining oil revenue, 70% was allotted to development affairs in Libya through the Development Council, with 15% going to the federal government and 15% to the province within whose borders the oil was extracted.

A 2.125% royalty in Pan American Oil Co.'s concession in Libya was purchased in 1959 by the Christiana Oil Corp.

NATIONAL FACTORS

The principal factors affecting oil investment are favorable; they were outlined in previous issues of *World Petroleum Report*. They include political stability and low taxation, with discoveries shallow and near the coast (about 100 miles), which means low-cost production on the less vulnerable side of the Suez Canal and near Europe's crude markets.

Although prospects have been enhanced by political stability, as the stakes grow so do the worries. Politically, the country is essentially a tribal society within the government, wherein the King operates wide powers which he could use to upset the fiscal or other oil plans on short notice. The king is also old, and his successor is not considered capable of a firm rule.

The principal determinate has been the administration of the oil law, through the Petroleum Commission. More than any other single individual, Mr. Anis Qasem is responsible for its direction. So far oil policy has been used as a flexible instrument to meet any changing circumstance. In this way, the requirements have deviated considerably from those originally laid down in the oil law.

Most important has been the gradual elimination of the depletion allowance which amounts to 25% of the gross income realized by the company. The Commission was able at first to require that expenditure of such sum of exploration provided that any sum remaining unspent in that manner shall return to the profits. The first concession to contain such term was concession 73 granted to Texas and California. The Commission granted five concessions in which, with some variations such a provision was incorporated. Then the Commission started insisting on the complete and final surrender of the depletion allowance in respect of the new concessions. As regards old concessions, the Commission has bound itself to respect them and will not touch them except with the agreement of the parties concerned. The Commission took the first step to limit the effect of the depletion allowance on old concessions however when it agreed with B.P. Exploration Ltd. (formerly D'Arcy) to have the company surrender the depletion allowance in respect of its old concessions as well as the two concessions recently granted on September 5, 1959. British Petroleum is an English company and the surrender of the depletion allowance meant less to it. Some American companies, however, are considering its surrender in a desperate attempt to get rights and one major has surrendered it in the case of an assignment.

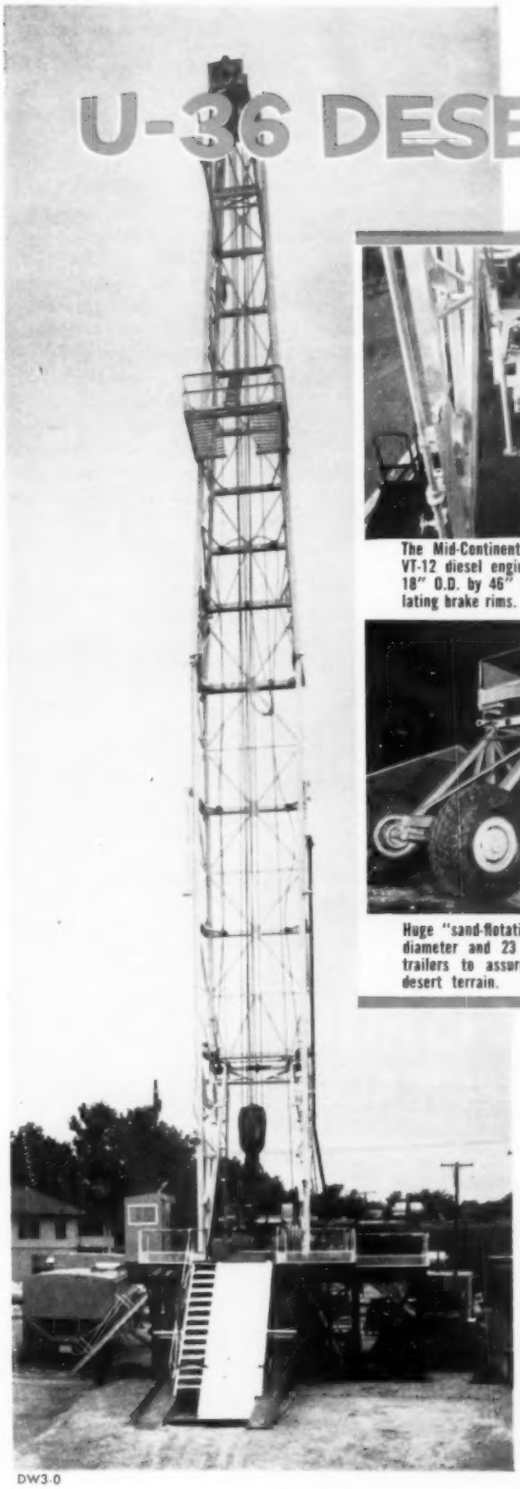
The Commission now does not grant any concession unless it is accompanied with definite working obligations which on failure would make the company surrender the area. Negotiations have also started with a "certain company" to establish a refinery in Libya to meet at first the essential local requirements of petroleum products.

LIBYA—Exploratory Wells

(By Libyan American Oil Co., owned by Texas Gulf Producing Co.)
(As of August 28, 1959)

Well	Location	Total Depth (feet)	Status
Gerdes El Abid # 1	Concession 18—Cyrenaica 4 km SW Gardes El Abid	9,372	D & A
Marsua #1-A	Concession 18—Cyrenaica 20 km SE of Maraua	8,652	D & A
Frazugha #1	Concessions 18—Cyrenaica 32° 31′ 12″ N 20° 43′ 45″ E	12,000	D & A
Mobruk #A-1	Concession 17—Sirte 29° 57′ 11″ N 17° 17′ 16″ E	5,800	Oil Well Interval 5,622-5,800 ft flowed 504 BOPD 40 gravity. Interval 3,002-3,086 ft swabbed 118 bbl in 8 hours, 38 gravity.
Zahaligh #B-1	Concession 17—Sirte 29° 47′ 33″ N 17° 16′ 33″ N		Drilling 3,300 ft (Aug. 28)

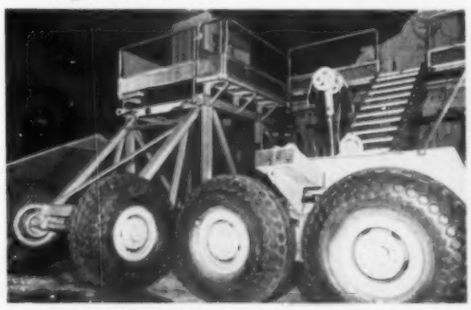
U-36 DESERT RIG for LIBYA



DW3-0

The Mid-Continent U-36 Drawworks, powered by Cummins VT-12 diesel engines with Torcon converters, features an 18" O.D. by 46" long drum and 44" by 10" water circulating brake rims.

After moving the drawworks trailer, this unique substructure is raised, the wheels swing into position and are pinned to give 18 inches of roadbed clearance.



Huge "sand-flotation" tires, each measuring 63 inches in diameter and 23 inches in width, are mounted on the trailers to assure safety in moving across the sandy desert terrain.

The utility trailer carries two Cummins model HRG-G diesel engines with 75KW AC generator sets, and other auxiliary equipment.

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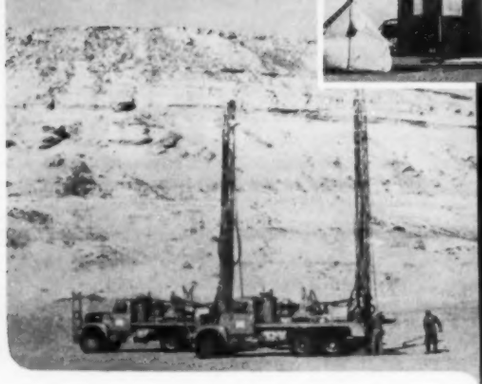

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EGYPT

EXPLORATION: During 1959 interest in the Western Desert of Egypt began to revive with discoveries in nearby Libya. Sahara Petroleum drilled several dry holes some years ago (see map in *WPR 1959,* p. 110) and surrendered its concession over the area, but none were in the southwest corner where Libyan indications now lead oil companies to feel there are possibilities. At least one company, Pan American International Oil Co. (subsidiary of Standard of Indiana) is negotiating for a concession. Shell-BP, ENI, and others are reportedly interested.

Eastern Petroleum Co. drilled Sidri 4, near the Gulf of Suez, which came in as a 5,000 b/d well, and Egyptians say the find may be the biggest ever made in the country. Eastern Petroleum Co. is held 49% by the government and 51% by International Egyptian, owned by ENI and Petrofina. This company has developed three fields, Belayim, Wadi Feiran, and Abu Rudeis, which produce about 33,000 b/d. Sidri 4 has been classified as a discovery because the first two tests produced water only. Sidri 3 is an oil producer but, strictly speaking, it is part of the adjoining Abu Rudeis.

The government has been exploring through General Petroleum Co., which has made two discoveries: Ras Bakr and Karim, discovered in 1958 along the Gulf of Suez. Ras Bakr may be one of Egypt's best fields. General Petroleum says a 3,520-ft development well encountered four oil zones. The best horizon, an 84-ft section between 2,824 ft and 2,908 ft, yielded oil at the rate of 310 tons, or about 2,200 b/d, on a 3½-in. choke. The fields were expected to produce 10,000 b/d in 1960.

The company has completed 12 producing wells at Ras Bakr (as of Dec. 1, 1959) and 5 at Karim. Tests at the Ras Bakr wells produced 22 to 23 gravity crude on 10mm choke at about 810 b/d. Karim produced about 825 b/d per well on test, according to Dr. Selim, the company director.

General Petroleum plans to spend $11.2 million during 1960, using two rigs for development drilling with a third to go into operation at Ras Bakr soon. The company will drill exploratory wells first at Rahmi and Ezz-el-Erban, north of present finds, and later on the Sinai coast. It is acquiring four Russian turbodrills in 1960, two of 10,000 ft capacity and two of 16,000 ft. Seven field parties will operate in 1960.

Eastern Petroleum has obtained licenses on offshore areas adjacent to its existing acreage, and plans to drill.

PRODUCTION: During 1959 production continued its upward climb, due mainly to the increase from the Belayim and Abu Rudeis fields. Production from Belayim increased to 25,800 b/d in 1958. At Abu Rudeis, production for 1958 amounted to 7,400 b/d. The productive limits of neither of these fields have been established so far.

MARKETING: Egypt is the largest oil consumer in the Middle East, and has one of the world's largest per-capita consumptions of kerosine. Inland demand for oil products is about 80,000 b/d and rising. Local production now covers about four-fifths of local needs.

Gasoline demand has fallen slightly owing to the shift to diesel vehicles, accentuating the existing refinery surplus of gasoline. Diesel consumption will increase further when the present dieselization program of the railways is completed. This will, however, displace fuel oil which the railways now use at a rate of half a million tons annually.

Fuel-oil demand is steadily growing and, in spite of reduced needs of the railways, electricity generation now accounts for 520,000 tons yearly, with an expected increase of four or five times by 1975.

Suez Operation: The annual report of the Suez Canal Authority came out in complete form in September 1959. It showed a record year for the canal, with no serious delays in transit. The head of the canal, Colonel Younes, has extensive plans for improvement. Additions during 1958 included a 25,000 dwt drydock, piloting in the Red Sea (formerly only available in the canal itself), and a training program for pilots which will replace the 100-odd pilots of nationalities other than Egyptian in mid-1960.

During 1958, 9,588 oil tankers transited the canal, with a total tonnage of 107,816,000. Other traffic added 46,663 tons, for a total of 154,479,000 tons transited in 1958. 94,401,000 metric tons of petroleum transited northbound. Southbound only 2,376,000 metric tons transited in 1958. Most of the southbound traffic was destined for the UAR itself; the rest went to the Far East and Middle East. Most of it (1,463,000 metric tons) originated in Russia. Northbound crude oil was 84,092,000 tons of the total, followed by fuel oil with 4,628,000 tons. Kuwait was the biggest source, with 50,984,000 tons, followed by Iran with 16,588,000 tons. England was the largest destination (24,307,000 tons), and France followed with 15,955,000 tons.

OIL LAWS

During 1959 the oil law of Egypt and related legislation was published in an unusually complete series known as *"North Africa—Basic Oil Laws and Concession Contracts (Original Texts)."* It includes a word-for-word translation of Egypt's oil law, as well as oil laws of Tunisia, Algeria (the OCRS law and related legislation for taxes and establishment of the French Commonwealth), and Morocco. The volumes are available from the publisher, *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* Inquiries should be sent directly to that address.

Petrofina participates with Italians and Egyptians in a new contract subject to the standard 50-50 formula for sharing of profits on 13 new tracts along the Sinai coast. A formal statement issued by the Belgian firm said that the announcement that 75% of the net profits would go to the Egyptian government and 25% to Cie. Orientale des Pétroles d'Egypte was "erroneuos." Egyptian entities hold 49% of COPE's capital, Petrofina said. As stockholders, they will receive "half" of the profits after taxes. The other 51% of COPE is held by the Panama-incorporated International Egyptian Oil Co., which is controlled jointly by Petrofina and Italy's State-owned Ente Nazionale Idrocarburi.

NATIONAL FACTORS

For a review of the factors affecting investment in Egypt, see the previous issues of *World Petroleum Report.* During 1959 no significant changes occurred in the national orientation toward international investment. The UAR has proved exceptionally efficient in administration, and oil laws are reasonable.

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RUSSIA

EXPLORATION: The exploratory drilling target for 1959 to 1965 is 40 million feet, mostly in new regions. Drilled footage increased in 1958 to 23.6 million, from a past yearly average of 16.4 million. Discoveries between 1946 and 1955 numbered 287 oil and gas finds, and 466 extension fields and stepouts within known fields.

The more important recent discoveries include a major oil find in August 1959 in the northern Ukraine; the test well is said to be producing 700 b/d of high-grade oil. Discoveries in 1958 in European Russia included those along the Dnieper and Don Rivers, southwest of Kharkov in the Ukraine; and shallow finds from 2,300 ft to 4,900 ft at Poltava and Kacha in the Crimea, and at Sumy. Under development currently are discoveries in the Lvov area (3,773 ft); at Valeni, in the Moldavian Republic (1,312 ft)—with discoveries anticipated from Lvov to Drogobych.

During the fall of 1959, three fields were discovered in Perm province within 40 to 50 miles of the producing oil fields of Kukhtyuskoye, Ulukskoye, and Yarino—with a test well producing high-gas-content crude (6,000 cu ft per ton).

In the Tatar Republic, the new Saikaratay oil field—under development since late 1959—will see only 165 wells drilled in the 88-square-mile area. Tatar's crude output should rise 2.3 times by 1965, when 80% of its wells will be equipped with automatic control devices. Oil fields in Tatar totaled 25 by 1958, with Romashkinsky leading all Soviet oil fields in yearly output.

First well to be drilled in Russia from a floating barge was completed in November 1959, five miles from Cape Alyaty.

Kazakhstan Republic reported two discoveries in 1959: one in the Guryev district, 25 miles from Saghiz; the second is close to Dossor field. In northwestern Kazakhstan, high-grade oil was found at Kustanai.

In the central Asian republics in 1959, discoveries in Turkmenia in August included oil and gas finds in southeastern Kara-kum, in the Kopet-dag foothills, at Kotur-tepe, and around the Kara-Bogaz-Gol area. Crude production should rise with completion of the 1,000 planned wells in the Kotur-tepe field and offshore west of Cheleken Island. Turkmenia's gas reserves are now almost 90,000 billion cubic feet.

Drilling: Total footage drilled in 1959 exceeded 25 million feet—53% for exploration. 87% of all drilled footage was by turbodrill—with average speed of 3,900 ft per rig per month. Drilled footage in 1958 totaled 23.6 million—of which development was 10.6 million and exploratory 13.0 million.

Natural Gas: The current Seven-Year Plan calls for natural-gas resources to be developed at an unprecedented rate: drilling of 6,560,000 ft annually for a total of 49.2 million feet of gas wells by 1965. Originally proved gas reserves were to rise to 106 trillion cubic feet by 1965, but new discoveries in 1959 have already upped this figure.

Among recent important gas discoveries are two in southern Bashkiria—one with reserves estimated at 8,800 billion cubic feet; the other at Lysinskaya, near Kumertan, has 10 promising deposits.

Gas production in 1959 was kept below 1.2 trillion cubic feet because of inadequate gas lines and compressor equipment, and storage; but initial storage was completed in the fall of 1959 in the Kuibyshev area aimed at supplying the Middle Volga chemical industry.

TRANSPORTATION: The expanding oil pipeline network jumped to 8,750 miles in 1958 from 7,250 in 1956. Target for 1965 is 26,250 miles. Scheduled for completion prior to 1960 were the following major pipelines (28-in. and larger): *Crude lines:* (1) Tuimazy-Omsk-Irkutsk; (2) Almetyevsk-Gorkiy-Ryazan-Moscow, with branching to Yaroslavl; (3) Almetyevsk-Perm; (4) Ishimbay-Orsk. *Products lines:* Kuibyshev-Bryansk.

Far more important are Russia's projects for the Baltic Sea. The Klapeida (Memel) harbor in Lithuania has been deepened for large tankers; and under construction are new quays, storage, and pumping installations. A Ural-Volga crude line is nearing completion—with branching projected to Ventspils (Windau) in Latvia where a refinery is being built. These projects are planned for 1960 completion, when the two harbor areas should become the terminus for Russia's planned oil exports to Scandinavia.

Gas transmission is still unprofitable. High-level capital outlays and depreciation (60% of transmission costs) result in higher gas-transmission than gas-production costs. Proposed remedy is to make future gas lines 32-in. and, later, 40-in. One-fourth of the Soviet iron and steel industry is fueled by natural gas.

Planned gas output of 53,000 billion cubic feet by 1965 is to be distributed: (1) 706.2 mmmcf for urban and rural civilians; (2) 318 mmmcf for chemical industry; (3) 459 mmmcf for cement industry; (4) 2,224.5 mmmcf for industrial fuel; (5) 1,589 mmmcf as raw material.

PRODUCTION: Production level in 1959 of crude oil was 127.2 million tons (2,544,000 b/d); natural gas, 1,157.8 billion cubic feet. Crude production in 1959 rose 13% over 1958; and natural gas 10%, far less than the spectacular rise of 45% in 1958 over 1957. Over 70% of the 1959 crude output came from the Ural-Volga region; some 15% from Baku. Almost a fourth of the 1959 crude production was by secondary recovery—with 14 million cubic feet of water injected and a large quantity of gas injection.

Planned crude-oil production in 1960 is to rise to 2,880,000 b/d—336,000 b/d over actual 1959. Target for 1965 is 4.6 to 4.8 million barrels daily.

Soviet natural-gas production at 980 billion cubic feet in 1958 is to rise to 1,845 billion in 1960 under the Seven-Year Plan, and to 5,200 billion cubic feet by 1965.

Reserves: Definite figures are not available, but estimates place present proved crude-oil reserves at 29 billion barrels. Total gas reserves were estimated in 1959 at 35,300 billion cubic feet.

REFINING: The current Seven-Year Plan, as well as the "prospective" 15-year plan, calls for large refinery construction—at a faster growth rate than for crude output. All future refineries will be standard plants of 120,000 b/d, 240,000 b/d, and 360,000 b/d capacity—equipped with desalting and desulfurization units, as well as reforming, catalytic, pyrolysis, and gas-fractionating installations, for a complete line of oil products and petrochemical raw materials. They will be located in the main producing and consuming centers, or close to projected petrochemical works.

By 1972, 300 million tons per year (six million barrels daily) of new processing plant should be finished, against planned crude production of 354 million tons (7,080,000 b/d)—with 50 million tons (a million barrels daily) of outmoded high-cost plant to be scrapped.

Stalingrad refinery was completed in 1959. Crude comes via a 195-mile pipeline from Shirnoye oil field.

The new refineries at Gorkiy and Perm are already in partial operation; and the Ryazan plant, south of Moscow, is nearing completion. Under construction since mid-1959 is a refinery in the Karadag area where large oil deposits have been discovered. Slated for early completion is the Ventspils (Windau) plant to process primarily heavier products for export to Scandinavian markets.

USSR—Soviet Gas Production and Reserves
(Billions of Cubic Feet)

	Production	Proved Reserves at End of Year
1940	113	600
1945	115	1,175
1950	201	3,800
1955	315	16,400
1958	980	32,900
1960 Plan	1,845	
1965 Plan	5,200	120,000

Table compiled by Theodore Shabad for API annual meeting, Nov. 1959.

USSR—Soviet Energy Consumption
(Per Cent of Total)

	1958 %	1965 Plan %
Coal	58.1	41.8
Crude Oil	25.7	32.7
Gas	5.4	17.0
Peat	3.2	2.6
Firewood	4.0	2.4
Oil shale	0.7	0.7
Water power	2.9	2.8
	100.0	100.0

Note: Total energy consumption in crude-oil equivalents: 1958—8.8 million barrels per day; 1965 plan—14.1 million barrels per day.

Table compiled by Theodore Shabad for API annual meeting, Nov. 1959.

USSR—Soviet Exports (Crude and Products) by Major Countries
(Thousands of Barrels Per Day)

	1957	1958
China	36	50
United Arab Republic	21	44
Czechoslovakia	26	30
Poland	26	30
East Germany	21	22
Italy	10	22
Hungary	18	22
Sweden	11	17
Finland	20	15
France	11	14
West Germany	15	11

Refining capacity during 1958 rose by 11 million tons (220,000 b/d), 12% over 1957. Newly installed refining capacity should reach 300 million tons (6,000,000 b/d) by 1972.

PLANNING: 1959 marked a turning point in the Soviet orbit, with dovetailing of Eastern Europe's national plans into Russia's Seven-Year Plan, 1959-65. Goal is for Russia to emerge as permanent oil supplier to Eastern Europe. Higher production targets for the plan period aim primarily at alleviating shortages—with fuel abundance envisioned only after 1965.

Planned targets for 1965 include crude production of 4.6 to 4.8 million barrels daily; natural-gas production of 5,295 billion cubic feet yearly; an oil trunk pipeline system of 26,250 miles, with 19,685 miles of major gas lines; and a 460% growth in crude and products transported.

Biggest item blueprinted in the expenditure budget for 1959-65 is a capital investment for the oil and gas industries of 170 billion rubles, 2.4 times the level of the previous seven-year plan. Investment in the petrochemical industry, 1959-65, is to average 15 billion rubles per year. Expansion in the petrochemical industry during 1959-65 includes building of 140 new works and reconstruction of 130 existing plants.

ALBANIA

PRODUCTION: Crude production in 1959 was about 11,000 b/d, 36% above 1958 (planned to go to 50,000 b/d by 1965). With 24 rigs from Russia, the Stalin Petroleum Combine drilled in 1959 some 160,000 ft, and for the first time completed 9,000-ft wells and deeper.

REFINING: Besides two old small-capacity skimming plants, the only refinery is the 3,000 b/d plant at Cerrik. In 1959 it produced 34% more gasoline than in 1958.

Consumption: Domestic consumption is about 2,000 b/d.

ALBANIA—Crude-Oil Production
(Thousands of Barrels Per Day)

Year	
1948	1.6
1957	9.0[1]
1958	7.0
1959	11.0
1960	16.4

[1]One metric ton equals 6.672 bbl.

BULGARIA

EXPLORATION AND PRODUCTION: 1959 crude oil production levels were about 4,900 b/d, almost 10% over 1958. Some 100 producing wells yield average 49 b/d. Preliminary targets are for 7,000 b/d of crude in 1962 and 20,000 b/d by 1965.

Reserves: Proved reserves at the beginning of 1959 were about 20 million barrels; and natural-gas reserves, 12.4 billion cubic feet.

REFINING AND MARKETING: With a 130-million-ruble Soviet loan, Bulgaria is to erect a 20,000 b/d refinery at Burgas—including a plastics plant— to go onstream in 1963. A second 20,000 b/d refinery is planned for the Black Sea coast.

Oil consumption is expected to rise to about 18,000 b/d by 1962 (14,000 b/d in 1957). Domestic production is insufficient to cover inland demand, and much of Bulgaria's crude must be exported for lack of refining capacity. Present product requirements come primarily from the USSR and Romania.

BULGARIA—Crude-Oil Production
(Thousands of Barrels Per Day)

Year	
1954	0.6
1958	4.0
1959	4.9
1960	7.6

Note: Converted at 7.3 bbl per metric ton.

CZECHOSLOVAKIA

EXPLORATION: Exploratory drilling has been carried out, on a modest scale, in eastern Slovakia around Senec and Bernolakova; in southwestern Slovakia; and in southern Moravia.

PRODUCTION: Crude production in 1959 was about 2,700 b/d (2,000 b/d in 1958)—the bulk of it from Slovakia.

REFINING AND MARKETING: Crude capacity in 1959 was estimated at 51,000 b/d, including the two existing refineries at Dubova and Bratislava, the special plant at the Most Works, and completed parts of the refining and petrochemical facilities under construction at Vlcie-Hrdlo, near Bratislava.

With completion of the Vlcie-Hrdlo refinery after 1960 and reconstruction of old plants, crude refining capacity should rise to 106,000 b/d by 1965. By 1970, crude capacity should rise further to 153,120 b/d, to 218,415 b/d by 1975—with crude imports from Russia increasing to 110,000 b/d in 1965 (42,000 b/d in 1955), and to 234,000 b/d by 1970.

Crude will be received after 1960 from Kuibyshev (USSR) through a projected 2,500-mile pipeline. With two parallel lines crossing Czechoslovakia 595 miles from the Czech-Soviet border to West Bohemia, the pipeline should cut by 40% the cost of imported crude from Russia.

Natural Gas: Principal sources still are the Vysoka gas field near Malaky, and the Cerky-Tesin field near the Czech-Polish border.

Consumption: Oil-product consumption rose to about 24,000 b/d in 1958, and is estimated to double in the next six years.

CZECHOSLOVAKIA—Crude-Oil Production
(Thousands of Barrels Per Day)

Year	
1948	0.9
1957	2.0
1958	2.0
1959	2.7

One metric ton equals 6.782 bbl according to International Petroleum Trade, Oct. 1957, Vol. 26, No. 10 p. 97.

EAST GERMANY

EXPLORATION AND PRODUCTION: Geophysical location of more than 100 possible oil-and-gas-bearing structures has led to upward revision of 1960 targets to 1,400 b/d for crude and 2,119 million cubic feet of gas, compared with actual production in 1958 of only 90 b/d of crude and 1,271 million cubic feet of natural gas. Crude output in 1959 was about 140 b/d.

REFINING AND MARKETING: A major oil-refining and petrochemical plant is under construction at Schwedt on the Oder to process Soviet crude, to come via the projected Kuibyshev pipeline. Crude capacity by 1963 should rise to 25,000 b/d, and to 96,000 b/d by 1965.

Production of manufactured gas exceeded 1,140 billion cubic feet in 1959. Another gas trunk line will be built from Schwarze Pumpe Combine to Berlin; and the gas-line network from Leipzig will be extended, via Magdeburg, to the Baltic coast.

The East German economy now depends on coal for 98.7% of its primary energy needs, and for the rest on oil. Domestic consumption now exceeds 40,000 b/d. Crude is imported from Russia (1.5 million tons in 1958, and 1.04 million in 1957).

EAST GERMANY—Crude-Oil Production
(Thousands of Barrels)

Year	Per Year	Per Day
1959	289[1]	0.8
1960	1,095	3.0

[1]One metric ton equals 7.3 bbl, an assumption made in the absence of a conversion factor from sources.

COMMUNIST CHINA

EXPLORATION: By the end of 1959, commercial oil fields had risen to 26 and natural-gas to 10. During 1959, 916 exploratory crews (excluding those of the Ministry of Geology), were active—94 of them geophysical crews.

Between 1949 and 1958, exploratory drilling totaled 11,053,600 ft, and 2,964 wells were drilled to an average depth of 3,730 ft. Exploratory and development drilling during 1958 totaled 4,854,400 ft, and in 1959 may have reached almost six million feet. Modern rigs operating during 1959 numbered 480, including several Russian and Romanian turbodrills. More than 600 wells were completed—the majority exploratory. Pressure-maintenance and secondary recovery techniques included water flooding, gas repressuring, hydraulic fracturing, and reactivation of abandoned wells.

PRODUCTION: Preliminary official estimates place crude production in 1959 at 3,955,000 tons (80,000 b/d), 75% over 1958. Increasing production in Yumen and Karamai oil fields

and progressive development of the central Szechewan and Tsaidam basins account for the high crude level in 1959. Sinkiang-Uighur fields doubled their output, but half the crude still comes from the old Yumen development in Kansu province.

Reserves: In relation to proved crude reserves of more than 200 million tons (1.4 billion barrels) (government estimate), current production is small. Many wells will remain shut in until tubular goods, and transport and processing facilities improve.

REFINING: During 1959, 2,600,000 tons of new refining capacity (52,000 b/d) went onstream, raising total capacity to more than four million tons (80,000 b/d)—a level slightly higher than crude production.

Plants which recently went onstream include the 20,000 b/d Lanchow refinery; the reconstructed Shanghai works, whose capacity now equals Lanchow's; the enlarged Tushantze plant —plus a score of smaller 200 b/d to 6,000 b/d units completed in central Szechwan and Karamai basins. Under construction is a 5,000 b/d plant at Yushashan (Tsaidam basin), and a 60,000 b/d refinery at Shihotzu on the Manas River (Gobi Desert). No projects for building larger refineries have been announced; but local plants of 0.3 b/d to 6 b/d, and of 10 b/d to 60 b/d, are mushrooming all over China to satisfy the increasing needs of liquid fuels for farm machinery and transportation.

Synthetic Liquid Fuels: Substantial progress has been made in the production of synthetic liquid fuels. Hundreds of small inefficient plants —burning interchangeably shale, bituminous coal, lignite or peat—were added all over China during 1959.

HUNGARY

EXPLORATION: A drilling target of 1,180,-800 ft for 1959 was more than double the actual 1955 footage—almost 80% for exploration. It is not known whether the goal was reached. Some 700 workers are engaged in exploration, 180 of them on seismic crews.

PRODUCTION: Crude production rose to 19,-500 b/d, 19% over 1958, but less than the plan target of 21,320 b/d and below the record 24,-040 b/d attained in 1956. About 70% came from Nagylengyel; the rest from Zala fields. Plan target for 1960 is 22,000 b/d; and, for 1965, 34,000 b/d to 36,000 b/d.

Reserves: Present plan calls for reserves to rise not less than 30 million tons (about 210 million barrels), for which 3.9 million feet would have to be drilled (both exploration and development) at depths from 13,100 ft to 16,400 ft.

Natural Gas: More than four billion cubic feet were produced in 1959. Trebling of gas production by 1965 envisions development of recently discovered gas fields in the lowlands. An additional 7.4 billion cubic feet will be received annually from Romania through the newly completed 231-mile 11-in. Sarmas-Tiszapalkonya pipeline.

REFINING: More than 40,000 b/d of crude—half imported from Russia—were processed in 1959. Two new refineries will be built before 1965 to process crude imported after 1963 through the pipeline from Kuibyshev (USSR).

Consumption: Consumption in 1958 was estimated at about 36,000 b/d, half from the USSR. Cost to Hungary of Soviet oil is high, for it comes from the USSR via rail.

HUNGARY—Crude-Oil Production
(Thousands of Barrels Per Day)

Year	
1948	10.1
1958	20.0
1959	19.5
1960	40.0

Note: Conversion from metric tons at 7.63 bbl per metric ton.

POLAND

EXPLORATION: Footage drilled for oil and gas in 1959 was 393,600 ft, 40% more than in 1958 and almost equal to the postwar peak of 395,000 ft in 1952. Target for 1960 is 478,650 ft.

Most of the exploratory drilling in 1959 was concentrated between Lubachow and Mielcz; around Przemysl; and, for the first time, in the Przeworsk area.

PRODUCTION: Crude output during 1959 remained at about the level of the past four years—3,600 b/d. No target has as yet been set for 1960 or for the new five-year plan period 1961-65. However, with scant reserves and slim hope for good discoveries, significant growth is improbable.

Natural Gas: With substantial discoveries at Swarzow-Tarnow and Dabrow-Tarnowa (output averaging 300,000 cu ft per well per day), target for 1959 was set at 17 billion cubic feet, 26% higher than 1958 production. New discoveries were made during 1959 at Przeworsk, in the Rzeszow region, where probable reserves may be several billion cubic feet; at Jaroslaw near Przemysl; and at Ludachow, Mielcz, and Lejaisk—all located north of the producing oil fields.

Poland's proved gas reserves were estimated at the end of 1959 as 141 billion cubic feet, sufficient to support an annual output of 18 billion cubic feet.

REFINING: Aggregate crude capacity of the five existing refineries averages 15,000 b/d. At present, only the Trzebinia and Jaslo refineries have thermal cracking facilities. Aggregate output of the synthetic fuel plants at Oswieczim and Zabrze-Zaborzo is about 1,000 b/d.

MARKETING: Total oil products consumed in 1957 amounted to about 34,674 b/d—estimated to rise to 41,400 b/d in 1960. 90% of current needs are covered by imports, mostly from the USSR and Romania. The USSR supplies practically all of the crude for Polish refineries.

Planning: Crude imports in 1959 are estimated at 4.6 million barrels and products at 10 million. According to a 1958 agreement with Russia, Poland is to become self-sufficient by building an integrated refining and petrochemical plant at Plock on the River Vistula, halfway between Warsaw and Torun. Plan capacity for 1963 is 40,000 b/d, 80,000 b/d by 1965-66, and 160,-000 b/d by 1975. It will process Russian crude carried from Kuibyshev by the projected pipeline.

POLAND—Crude-Oil Production
(Thousands of Barrels Per Day)

Year	
1948	2.8
1957	3.7
1958	3.6*
1959	3.6*

Note: Conversion at 7.419 bbl per metric ton.
*Estimate.

ROMANIA

EXPLORATION: During 1959, exploration was confined mostly to the stepouts of the Pitesti and Oltenia fields. Deeper drilling continued in these and in the Ploesti region.

Total footage drilled in 1959 was 2,810,000 —65% exploratory. No target has been set for 1960, but footage is estimated to reach 2,385,-600 ft. Drilled footage in 1958 was 2,624,000. Averiage well depth (all drilling) rose to 5,850 ft in 1959 from 4,490 ft in 1950.

Rigs numbered 316 in 1959 (all types, old and new)—including 20 Soviet and Romanian turbodrills; 15% of total footage in 1959 was drilled by turbos.

Production costs for Romanian crude have been rising steeply due to deeper drilling, efforts to extend life of declining wells, secondary recovery, high rate of dry holes, and drilling-crew idle time (up to 35%).

PRODUCTION: Romania in 1959 maintained its place as No. 2 crude producer in the Soviet orbit and No. 1 in Europe. Crude output at 12.7 million tons (255,400 b/) was 11.5% over 1958. Planned target for 1960 is 260,000 b/d.

Producing wells numbered 4,660—with average yield of 52 b/d. The old Ploesti region accounted for only 35% of 1959 production; the remainder came from fields developed since 1950.

REFINING: Of the 11 Romanian refineries, nine are old—but are to be replaced, enlarged, or modernized. Refining capacity has kept pace with crude output. By the end of 1960, capacity for primary distillation should rise to 280,000 b/d; for cracking to 86,000 b/d; and for lube oils to 12,000 b/d.

Natural Gas: Gas output in 1959 rose to 212 billion cubic feet, 18% over 1958. Of this, 7.1 billion cubic feet went to Hungary; 24% of the remainder was for domestic and 76% for industrial uses. Major gas lines in 1959 had a total length of 2,190 miles, with yearly carrying capacity of 350 billion cubic feet.

In 1959, gas accounted for 19% of overall energy consumption with oil products taking 53.3%.

ROMANIA—Crude-Oil Production
(Thousands of Barrels Per Day)

Year	
1948	87.6
1958	248.9e
1959	255.4
1960	260.0e

eEstimate.

NORTH AMERICA

ALASKA

EXPLORATION: Natural gas is in the spotlight, as shown by the high joint bid during 1959 of $1,001,123 made by Union Oil Co. of California and Ohio Oil Co. for 2,026 acres adjoining the discovery well of the Kenai Unit. Figures subsequently released credited Kenai Unit well No. 1 with a gas potential of 31 mcf.

1959 saw up to eight drilling rigs working, with a total of 112,400 ft drilled, compared with 47,578 ft the previous year. In 1959 seven wells were abandoned and six wells were completed as producers. Humble Oil & Refining Co.'s (as operator for itself and Shell Oil Co.) expensive Bear Creek Unit 1 in the Kantak area went to 14,374 ft and cost approximately $8 million.

Two other expensive tests, reportedly bottoming in basement, were the Great Basins No. 1 drilled to 11,080 ft and Great Basins No. 2 drilled to 8,865 ft. Mobil Oil was the operator. Other discouragements included Colorado Oil & Gas Corp.'s Yakutat 3 abandoned at 10,494 ft. Halbouty Alaska Oil Co.'s Halbouty-King 1 abandoned at 12,037 ft, in which Alaska Oil & Mineral Co. Inc. had a 25% working interest and Swanson Unit 32-22 abandoned at 11,774 ft. On the Iniskin peninsula, Alaska Consolidated is below 11,200 ft and fishing.

Field development continued on the Swanson River Unit, with SRU 4-A completed by Standard Oil Co. of California for 100 b/d. Other completions followed, with SRU 32-15 completed for 1,300 b/d and SRU 12-27 for 428 b/d.

Standard plans an 8-in. pipeline to tidewater and a loading terminal if the unit proves to have an assured production of at least 3,000 b/d for five years.

Standard Oil has also formed a new unit on the Kenai peninsula. The Soldotna Creek Unit contains 70,720 acres, and Soldotna Creek Unit No. 41-4 well was spudded 12/31/59 and is currently drilling below 5,000 ft. Other units, including a Bishop Creek Unit and Swan Lake Unit, are now in the process of formation covering leases on the Kenai.

Richfield Oil Corp. at Katalla-Yakataga No. 1 (south) was allowed to acquire options or assignments on 489,622 acres without violating its acreage quota. This block is the southern half of a development contract awarded to Phillips Petroleum Co. in 1953. Presently, Richfield is drilling below 7,000 ft on the Kaliakh No. 1 well, spudded December 3, 1959. In mid-October the Department of the Interior awared Richfield a development contract on the remaining acreage in the original Phillips contract.

A second development contract was granted Union Oil Co. of California and The Ohio Oil Co. Called the Knik Arm development contract, the area lies northwest of Anchorage, and covers approximately 229,000 acres. During 1959 Pan American Petroleum Corp. received, in the Kuskokwim-Bethel basin, approximately 465,280 acres in the Napatuk area near Bethel. Bristol Bay Oil Co., Sunray Mid-Continental Oil Co., and the Empire State Oil Co. also hold acreage within the contract area, and were expected to participate in the proposed exploration program. The contract called for Pan Am to spend a minimum of $950,000 on exploratory work and the drilling of three wells, the first which must be started by March 1, 1961.

The year 1959 saw a sharp increase in geophysical work, and crews worked in every major sedimentary basin in Alaska. Early in the year, 11 major companies jointly undertook a 3½-month seismic study of the waters of cook Inlet adjacent to the Kenai peninsula.

Interest in the Alaska arctic slope region has run high since the opening of the Gubik gas field to competitive leasing and the opening of four million acres on the arctic slope to filing under the Mineral Leasing Act. Colorado Oil & Gas Corp. has now acquired a majority of the leasehold interests on the portion of the Gubik field now under lease. Many companies are holding lease blocks. It is expected that 1960 will see an increase in the number of surface parties and some geophysical work.

On February 24, 1960, the Department of the Interior put 16 parcels covering 9,000 acres in the proven Gubik gas field up for bid.

Interest in the Porcupine-Kandik area has been heightened by the Canadian discovery, at Eagle Plains, of Western Minerals et al. No. 1 Chance which flowed gas and light-gravity oil.

PRODUCTION: The Richfield-Socal discovery at Swanson River has been on production at about 650 b/d. The completion of a pipeline to the coast will boost this considerably, if the field proves to have enough oil reserves.

REFINING: There is no refining in Alaska; all products used are imported.

OIL LAWS

Most of Alaska is subject to federal oil regulation of the United States; however, a new land act, passed in 1959 by the first state legislature, spelled out in more detail the oil and gas leasing provisions on state lands. Provisions are comparable to those in effect on federal lands in Alaska, except that an individual or corporation may hold up to 500,000 acres of state uplands and 500,000 acres of tide and submerged lands.

Development contracts have been awarded in widely scattered geologic basins. The Department of the Interior, which fought an increase in the acreage limitation to 300,000 from present 100,000 acres proposed by the oil industry and resulting in the President's veto, has urged the use of the development contract as a solution to the restrictive features of the Mineral Leasing Act. Under the typical development contract, the operator is awarded rights to acquire interests in a large block of leases without this acreage being charged against the 100,000-acre limit. The operator is usually required to drill at least one well within a specified period or lose his rights to hold the acreage.

CANADA

EXPLORATION: Despite intensive exploratory activity, no major finds were made in Canada during 1959. The last major discovery was at Pembina in 1953, but a series of medium-sized discoveries since then has built up a considerable productive capacity, estimated to exceed one million barrels daily.

During 1959 geophysical crew-months turned sharply downward for the largest proportionate decline in the past seven years of downtrend. The estimated total was 850 crew-months, a drop of 241 months, or 23%, from the 1958 total of 1,091 crew-months.

Well completions in western Canada declined slightly. The estimated total of 2,530 wells drilled in 1959 was down only 2% from the 2,588 completions of 1958. The 1958 total, by contrast, was off 13% from 1957.

The discovery ratio was exceptionally high, but few significant oil discoveries were recorded, although several good gas strikes were made. There were 131 indicated discoveries, comprising 68 oil and 63 for gas, for a combined success ratio of one in 4½ wildcats drilled.

Alberta: The discovery of oil at Judy Creek, about 12 miles south of the Swan Hills field of north-central Alberta, was the major oil event of 1959. By fall, a substantial field was being developed in the Beaverhill Lake member of Devonian coral-reef limestone. Imperial Oil Ltd. is the principal land holder.

Promising showings of Beaverhill Lake oil were also given by a discovery of British American Oil Co. Ltd. at Sarah Lake, halfway between Swan Hills and Judy Creek, but no development took place during the rest of the year following the strike in March.

A large Cardium sand oil discovery was made at Lobstick in April, and development went ahead quickly for the rest of the year. This strike, by Pan American Petroleum Corp., appears to be closely related to the northeast sector of the Pembina field, as its boundaries are now almost coterminus with Pembina.

The most significant gas discoveries were two related Lower Cretaceous strikes in the Cadomin sand member in the vicinity of the Kaybob oil field, west of Swan Hills, one by The California Standard Co. and The British American Oil Co. Ltd., the other by Pan American Petroleum Corp., Hudson's Bay Oil and Gas Co. Ltd., and Canadian Fina Oil Ltd. The pay zone was found at around a 7,000-ft depth.

Saskatchewan: The only important discoveries were made at Dodsland, in west-central

CANADA—Crude-Oil Production for 1959
By Provinces and Months
(Total Barrels)

Month	Alberta	Saskatchewan	Manitoba	Others	Total
January	12,498,236	3,795,495	432,208	187,329	16,913,268
February	11,626,510	3,579,051	383,208	185,711	15,774,480
March	10,931,756	4,296,914	437,362	200,163	15,866,195
April	9,072,059	3,734,174	422,474	162,958	13,391,665
May	9,503,649	3,672,382	433,816	155,248	13,765,095
June	10,495,706	3,837,041	422,351	180,804	14,935,902
July	10,299,430	4,304,975	438,371	200,000	15,242,776
August	11,037,179	4,300,000	436,480	200,000	15,973,659
September	11,784,140	4,200,000	424,834	200,000	16,608,974
October	10,503,389	4,323,260	434,000	217,000	15,477,649
November	9,670,590	4,375,800	420,000	210,000	14,676,390
December	11,849,347	4,242,195	434,000	217,000	16,742,542
Totals	129,271,991	48,661,287	5,129,674	2,316,213	185,368,595 (507,859 b/d)

Saskatchewan, where two significant strikes six miles apart extended the total length of the Dodsland oil field, first discovered late in 1958, to 18 miles east and west. Both discoveries were made by Sarcee Petroleums Ltd. and associates.

British Columbia: Gas discoveries led a phenomenal success ratio of one in two for B.C. wildcat completions in 1959. The most significant area was at Jedney and Bubbles, a few miles west of the large Nig Creek gas field along the Alaska Highway about 100 miles northwest of Fort St. John. By the end of 1959, there were 15 wells capable of producing in the dual field, from the Triassic formation, and reserves were estimated as at least 500 mmmcf (half a trillion).

At Petitot River, 70 miles northeast of Fort Nelson, Gulf States Oil Co. of Canada obtained a flow of almost 7 mmcf per day on a 3/8-in. choke from the Slave Point member of Devonian limestone. At North Daiber, 18 miles west of the Blueberry gas field, French Petroleum Co. of Canada Ltd. and Richfield Oil Corp. made a gas discovery in the Triassic sand with initial potential of 10 mmcf per day.

One important oil discovery was made at Beatton River, eight miles northwest of the Milligan Creek oil field, by Triad Oil Co. Ltd., in the lower Cretaceous sand, and another at North Boundary Lake, 20 miles east by south of the Milligan Creek field, by Sinclair Canada Oil Co. and Pacific Petroleums Ltd., in the Triassic sand. The latter discovery rated 672 b/d initial potential. Both were light-gravity oil, estimated at 43 and 40 API, respectively.

Manitoba: There were no operations of any importance in Manitoba during 1959, as wildcatting declined to less than one well a month, and no discoveries were made. Production remained steady at about 14,000 b/d throughout the year.

Northwest Territories: Heavy promotional activity by the dominion government resulted in the taking down of temporary exploration permits covering about one hundred million acres in the Arctic Islands, far north of the northern mainland coast of Canada. The permits were mostly granted to minor companies, which carried out some preliminary exploration, but which intend to find major companies to which they can farm out their holdings before heavy cash expenditures are involved. Indications from surface geological exploration conducted during the summer, according to field geologists, show many large structures. Estimates of possible oil to be discovered range as high as 150 billion barrels. No drilling was undertaken in 1959.

CANADA—Western Canada Well Completions, 1959

Province	Wildcat	Development	Total
Alberta	360	1,227	1,587
Saskatchewan	180	618	798
Manitoba	10	30	40
British Columbia	35	70	105
Total	585	1,945	2,530

Petroleum history was made in August 1959 with the first Yukon Territory discovery, a dual strike of oil and gas in the Permo-Pennsylvanian limestone, at the Western Minerals Ltd. Chance No. 1 wildcat at Eagle Plains. The location is 320 miles northwest of Norman Wells, first oil field to be discovered in the Northwest Territories, in 1920, and only 200 miles south of the Arctic Ocean at the Mackenzie River delta. Light oil was brought to surface on drill-stem test, and gas flow rate was measured at 10 mmcf per day. It is the farthest north petroleum to be discovered in Canada, but evaluation so far is indeterminate.

Eastern Canada: Marine operations under Lake Erie and Lake Huron progressed with great success in 1959, with a new record level of drilling activity. Oil discovery and development were satisfactory in Ontario also, and late in October came news of an oil well in the Colchester field in southwestern Ontario giving an initial open flow of 1,000 b/d to set a new record for the region. Imperial Oil, Harvest Petroleum Ltd., and Submarine Oil Ltd. are the major operators in this field.

Natural Gas: Production of natural gas across Canada showed by far the largest gain in 1959 over 1958, among all phases of the industry. The 1959 output of net salable gas soared to 437 mmmcf from 338 mmmcf in 1958, for an increase of 29%.

The Alberta Conservation Board in 1959 granted permits to Westcoast Transmission Co. Ltd. and Alberta & Southern Gas Co. Ltd. for most of the gas which they require to support a big joint export project covering the Pacific Northwest and Northern California. The board also granted permission to Trans-Canada Pipe Lines Ltd. to remove more gas from Alberta for its long-term future estimated needs to service eastern Canadian markets.

TRANSPORTATION: Natural-gas pipelines dominated the construction scene in 1959, with greatly diminished volume from 1958. The total mileage added, 2,700 miles, was down 25% in distance and much more in steel tonnage as very little big-inch pipe was laid. Crude-oil pipelines accounted for only 150 miles, all small-diameter gathering systems and short laterals. This was off 75% from 1958.

The Canadian total of main lines in operation for both oil and gas by the end of 1959 was nearly 12,000 miles, not including loops.

PRODUCTION: In an abrupt turnaround from the depressed 1958, crude-oil production soared in 1959 to a new all-time high of 508,000 b/d, for a gain of 11% over the 1958 average of 456,000 b/d. Although exports still lagged, the Ontario market provided a tremendous increase of more than 45,000 b/d, or almost all the net gain.

The outstanding feature was the accelerated growth of the domestic crude-oil market. Canadian outlets provide for 414,000 b/d, a gain of 43,000 b/d, or nearly 12%, over the 1958 average of 371,000 b/d. The Ontario increase was 28%.

Reserves: Crude-oil reserves at January 1, 1960, had increased to 3.6 billion barrels, a rise of 450 million barrels.

Exports and Imports: The export market in 1959 showed only a slight improvement over 1958, as Canadian producers found an outlet for an average of 93,000 b/d, up 9% over the 1958 average of 85,232 b/d.

Crude-oil imports in 1959 gained only 7%, to an average of 313,767 b/d from the 1958 average of 294,000 b/d. The excess of crude-oil imports over exports was thus 220,767 b/d averaged, while in 1958 it had been 209,000 b/d.

REFINING: No new major refinery construction projects were started during 1959. Two major new refineries will be completed next spring, and Canadian capacity will then be overbuilt to the extent of 25% to 30%, at 963,350 b/d. As the current growth rate is leveling off, this will be ample for the next two to three years, including seasonal peak loads. Thus no new refineries are going to be completed until 1962, according to present plans, and there are no projects now under way. Attention during 1959 was centered on two big enlargement jobs.

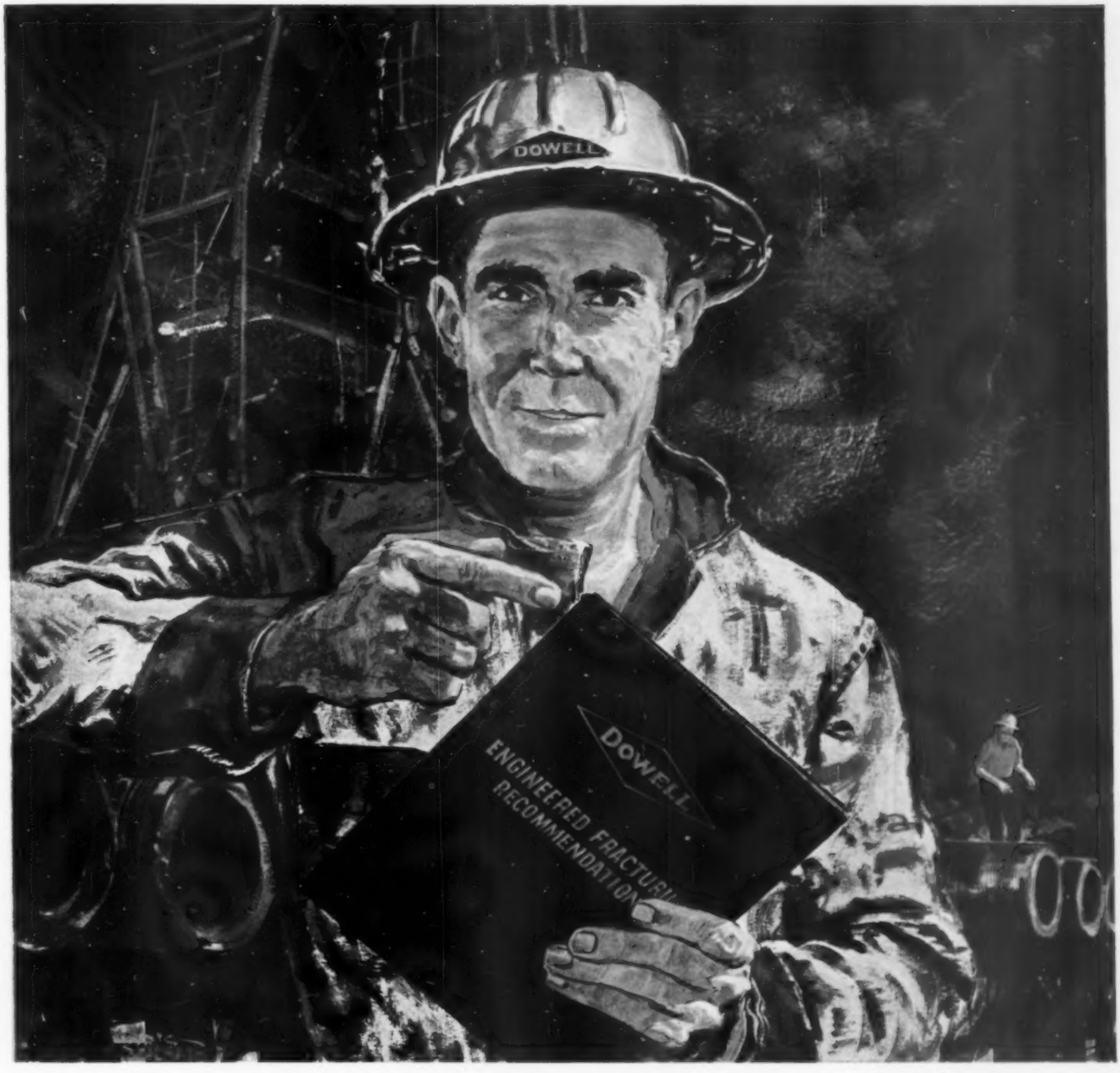
The new refineries under construction are the 25,000-bbl plant of British Petroleums Canada Ltd., in Montreal, and the 40,000-bbl refinery of Irving Oil Ltd. in St. John, New Brunswick. The principal expansion was addition of 20,000 b/d crude capacity at Canadian Oil Companies Ltd., Sarnia, Ontario. At Calgary, the Imperial Oil Ltd. refinery was substantially rebuilt to bring capacity up to 14,000 b/d from 6,750 b/d. Most refinery construction otherwise involved installation of product-improvement units such as new cracking, catalytic reforming, and alkylation units. These types of additions will be the prominent subjects of new capital expenditure in the next two years as well. The net addition to crude running capacity in 1959 was only 27,250 b/d. In 1960 it will be approximately 65,000 b/d.

Refinery crude receipts in 1959 are estimated

CANADA—Crude-Oil Receipts, 1959
(Total Barrels Per Month)

Month	Domestic	Imported	Total
January	13,971,134	8,808,158	22,779,292
February	13,501,197	9,142,265	22,643,462
March	13,079,591	9,396,498	22,476,089
April	11,604,731	8,879,191	20,483,922
May	11,439,448	10,790,495	22,229,943
June	11,873,862	9,230,778	21,104,640
July	12,117,342	10,085,356	22,202,698
August	12,843,787	10,690,759	23,534,546
September*	13,186,900	10,008,364	23,195,264
October*	12,525,690	9,609,000	22,134,690
November*	12,621,600	9,647,000	22,268,600
December*	13,415,900	10,469,000	23,884,900
Total*	152,181,182	116,756,864	268,938,046

*Estimated.



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at 269 million barrels, averaging 737,000 b/d, for a big gain of 12% over the 1958 figures of 661,000 b/d. Domestic supply in 1959 was 152.2 million barrels, up 12½% over 1958's 135.4 million; while imports of 116.8 million barrels were up only 10½% over the previous year's 105.8 million.

Ontario refinery crude receipts amounted to 76 million barrels, or 208,000 b/d, for an increase of 18% over the 1958 total of 64.4 million barrels, or 176,000 b/d. This was the most significant increase of all the principal geographic regions. Domestic crude supply rose by 21½% to 73.2 million from 60.3 million barrels; while imported supply declined by 32% to 2.8 million from 4.1 million barrels. The Ontario gain also amounted to more than 40% of the increase for all of Canada.

MARKETING: Consumption of petroleum products resumed its upward trend in 1959 after a year of negligible gain in 1958. The total of 297 million barrels, or 813,700 b/d, was up nearly 10% from the 1958 total of 271 million barrels, or 742,500 b/d.

OIL LAWS

During 1959 no fundamental changes occurred in Canada's oil regulation. For a review of regulations and for background of the present oil law situation, see *World Petroleum Report 1957*. During 1959 the oil laws of Canada were compiled in a publication entitled *"North America—Basic Oil Laws,"* which includes the USA and Alaska (which has some separate regulation apart from that of the USA) as well. It is available from its publisher, *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

During hearings of the Borden commission, much emphasis was laid on the effect of oil laws and their stimulation to drill wells in excess of actual need. Their effect has been blamed for the excess productive capacity existing in Canada at present.

In Quebec, recent interest in the oil prospects have led to substantial modification in the provincial oil regulation. These modifications are not yet complete, but are in the process of formulation. Considerable changes are under ways as well in Prince Edward Island, especially to bring the law more up to date in the light of present Canadian conservation practices.

The first compulsory unitization law was passed by the Manitoba legislature in 1959 as an extensive amendment to the Mines Act. It combines features of similar acts in Saskatchewan and Alberta.

Considerable attention has been paid to revisions of the oil regulations governing activities in the Far North, especially the Arctic Islands. The government, in an attempt to promote the discovery of low-cost crude supplies, has promulgated liberal regulations. Among other features, they provide for extension of the drilling obligation for three years, and land rentals of about 5¢ yearly for over six years.

NATIONAL FACTORS

There were two events of the utmost future importance for the Canadian petroleum industry in implied indications of dominion government policy. The first was the second report of the Borden Royal Commission on Energy, dealing with crude-oil markets. This report, in a notable switch of direction from the first report in the fall of 1958, declared strongly that a policy of encouragement to free enterprise should be adopted by the government, and that companies should be given an extended period within which to find enlarged markets for crude oil before any consideration should be given to imposition of import duties or quotas. It was also recommended specifically that no public aid be given to any proposal for construction of a crude-oil pipeline from the western oil fields to Montreal, unless all other means of increasing Canadian oil markets should fail. It set a target figure of 700,000 b/d by the end of 1960 as an objective for the industry to attempt to attain. As no statement of government policy or intentions has been made since publication of the report, the industry has generally assumed that the government has no substantial objections to the report but is also unlikely to take any positive steps to implement its recommendations, especially as to becoming involved in compulsive measures to attain the optimum oil market referred to.

The other significant event, with more positive implications, was the statement by Hon. Alvin Hamilton, in Calgary at the end of October 1959, in which he said that northern oil and gas exploration, especially in the Arctic Islands and the Northwest Territories, will take precedence in dominion government plans over all other matters of policy related to the oil industry. This, however, is admittedly a long-range operation, and it may be five or six years before much is known about these remote regions. Of more immediate significance is the apparent intention of the new National Energy Board to expedite the hearing of export permit applications which, if granted, would start additional revenue coming in for companies which are undergoing a squeeze on oil earnings.

UNITED STATES

The USA petroleum industry celebrated its 100th birthday in 1959 with a sharp recovery from the 1957-58 depression. Domestic demand increased 4.7% as compared with only 3% in the previous year. Refiners increased their crude throughput by 4.7%, bringing them a little above 1957 when runs were maintained at an unreasonably high level following the reopening of Suez. Production of both crude oil and natural-gas liquids was higher, and the drilling industry made a moderate recovery from its 1958 low, although no all-out drilling campaign was undertaken in view of soft world markets for crude and excess producibility in both Eastern and Western Hemispheres.

EXPLORATION: There was little incentive towards expansion of exploration activities in 1959 because of the excess producibility of existing wells when compared with market demand. Seismic parties in the field dropped below the previous year's average.

Exploratory drilling followed a similar pattern, up somewhat from 1958 but below 1957. Total exploration wells drilled for the year were estimated by the American Petroleum Institute, on a preliminary basis, at 10,125 compared with 9,588 in 1958 and 11,739 in 1957. Success ratio was about the same as in recent years; 86% were dry in 1959 compared with 87% in 1958 and 86.5% in 1957. Of the exploratory completions, 11.3% were oil wells compared with 11.2 in 1958 and 11.3 in 1957.

The API preliminary estimate on total well completions was 51,300, including 1,400 service wells, with a total footage of 211,000,000 ft. Net wells drilled for oil or gas totaled 49,900 compared with 47,772 in 1958 and 52,951 in 1957. Average depth of all wells was 4,113 ft.

Early in the year, the number of rotary rigs operating in the USA dropped to less than 1,800. By midyear, the number had risen to 2,240 which was nearly 200 rigs higher than at the same period in 1958. Toward the close of 1959, activity had decreased to 2,180 rigs compared with 2,300 a year earlier.

PRODUCTION: Sheltered by more severe import restrictions, the USA producing industry was able to increase its tempo in 1959. Production rose 4.85%, or 324,000 b/d, to 7,034,000 b/d. Output of natural-gas liquids was 8.3% higher, averaging 875,000 b/d. Imports of all oils rose 40,000 b/d, or about 2.5%, most of the increase being refined or partly refined oils in the early months of the year before more stringent rules had been placed in force.

Producibility of oil wells in the USA has been estimated at about three million barrels daily in excess of 1959 average demand. Some estimates are even higher than this. Most recent estimate by Kenneth Hill, of Eastman Dillon, is a producibility of 9.2 million barrels daily of crude and 1.2 million barrels daily of natural-gas liquids. This suggests that crude producers are operating at about 78% of capacity, and natural-gas liquids producers at 73% in 1959.

A year ago the Independent Petroleum Assn. of America estimated crude producibility at 9.5 million barrels daily and natural-gas liquids at 880,000 barrels daily as of January 1, 1958. In this connection, it is of interest that 1959 output of natural-gas liquid slightly exceeded the IPAA estimate of producibility at the beginning of 1958.

Early in November, L. F. McCollom told a meeting of the NOMADS at Chicago that world producibility is six million barrels daily above requirements in the free world, but that estimates of the duration of oversupply now are tending to drop to the three-to-five-year level.

REFINING: Capital expenditures in processing facilities rose to an estimated $770 million in 1959, a 6.4% increase over the 1958 total of $725 million, and are expected to remain at about that level in 1960. Most of the investment has been, and will continue to be, for plant modernization and revamps rather than for boosts in crude running capacity.

Refinery crude runs to stills averaged 7,983,000 b/d, an increase of 4.6% over the 1958 average of 7,642,000 b/d, but only a shade ahead of the 1957 average of 7,919,000 b/d. Operable plants were running at approximately 81.5% of their rated capacity of 9,803,750 b/d as of September 30, 1959, including 42,100 b/d shutdown for major repairs, according to the annual survey by the American Petroleum Institute. The trend in capacities over the past several years is as follows:

	Barrels Per Day
1955	8,632,390
1956	9,123,674
1957	9,407,707
1958	9,819,846
1959	9,803,750 (on 9/30)

Motor-fuel quality continued its upward climb, though at a somewhat slower rate: The national average octane number (research) for regular gasoline moved from 89.8 in 1957 to 90.2 in 1958 and to about 91.9 in 1959; while premium grade moved from 97.6 in 1957 to 98.4 in 1958 and to about 99.2 in 1959.

Two new catalytic hydrocracking processes were announced in 1959 by California companies—Standard Oil of California and Union Oil—with yields said to be in excess of 100% of liquid charge. They are designed for use in areas where competition from natural gas creates a surplus of middle distillates and for refiners who have hydrogen available from reforming operations.

Universal Oil Products offered a new method of continuous molecular sieving to refiners who find it necessary to remove low-octane components from their pool gasolines so as to meet knock-rating requirements. The year 1959 also saw the announcement of another process for the isomerization of pentanes and heavier—by Esso Research and Engineering Co. However, refiners in general still seem to prefer to obtain the desired octane improvement via the alkylation route.

Fastest growth segment of the manufacturing branch of the industry is still petrochemicals. More than 80% of the organic chemicals produced in the USA now are derived from petroleum. Expansion in this field is at the rate of 12% per year, double the rate of growth of the USA chemical industry as a whole.

Less than 4% of the hydrocarbons being produced in the USA are serving as chemical raw materials; yet the value of petrochemicals was $5.2 billion in 1958—56.6% of the value of the entire chemicals output of the nation.

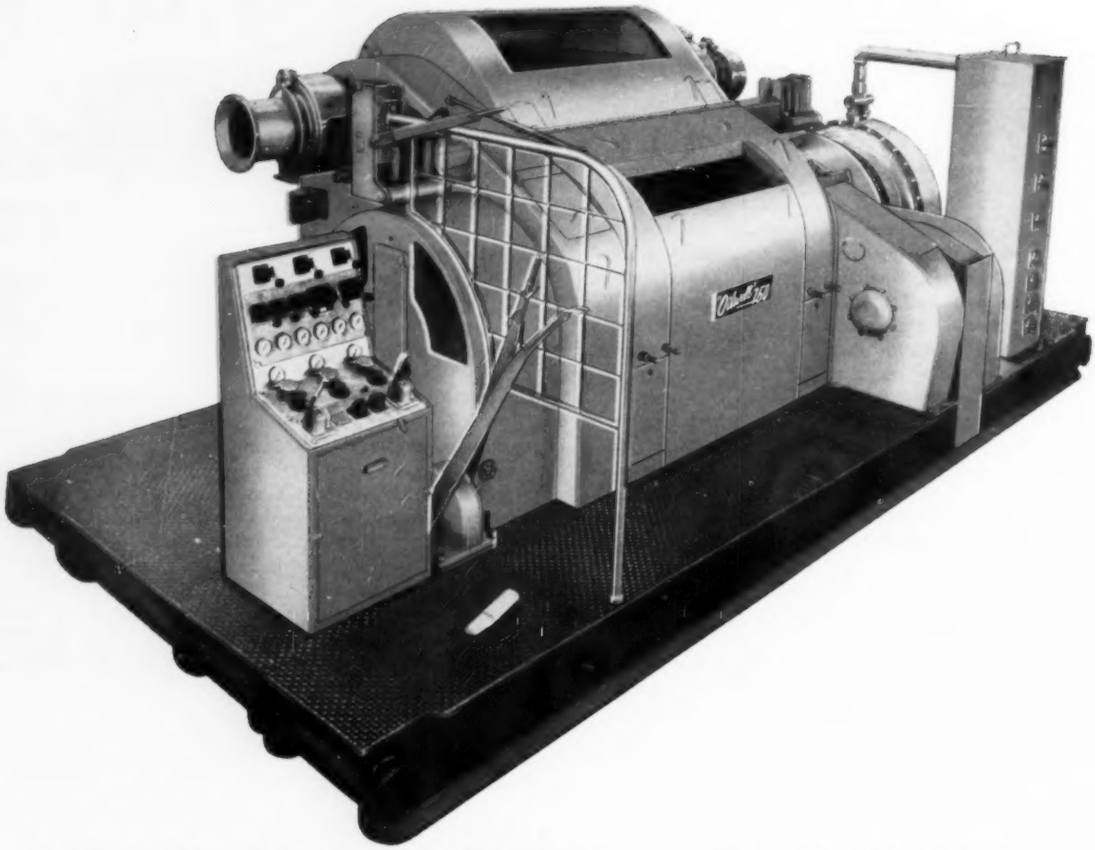
In Europe, petrochemical plants are being built to operate on olefins produceds by steam cracking of paraffinic naphthas, whereas in the USA most plants are based on natural or refinery gases. France is an exception to the European pattern because of its large gas reserves at Lacq.

LPGas—Sales of liquefied petroleum gas increased 16.5% in 1959 to 8,693 million gallons. Largest share of the increases was for synthetic rubber and petrochemicals. Demand from the synthetic-rubber industry rose 491 million gallons, or 32%, as the proportion of natural rubber in rubber goods decreased. Petrochemical manufacturers increased their take 26.2% to 2,396 million gallons. Motor-fuel demand rose 10% to 937 million gallons.

Domestic and commercial heating requirements in 1959 rose 9.4% to 3,064 million gallons, representing 41.5% of the total market for LPGas. A few years ago the heating load was more than half of the total market.

MARKETS: Crude and refined-oil markets were spotty in 1959. To support domestic markets, USA government restrictions on imports of unfinished oils and products were made more stringent after the first quarter. Refiners continued the liquidation of excess inventories at a moderate rate. The level of stocks still was high enough at times to exert pressure on markets. Crude runs to stills rose 5.7% in the first 10 months, while total domestic demand was rising 4.76%.

Imports of crude oil were maintained at a steady level of about 959,000 b/d throughout the year. The big reductions came in unfinished oils, residuals, and other refined products. In



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UNITED STATES—Supply and Demand
(Thousands of Barrels, Daily Average)

Supply	1959 Est.	1958	1957	1956
Crude production	7,034	6,710	7,170	7,151
Natural gasoline	875	808	809	801
Total domestic	7,909	7,518	7,979	7,952
Imports, all oils	1,740	1,700	1,574	1,436
Total supply	9,649	9,218	9,553	9,388
Demand				
Domestic demand	9,516	9,083	8,818	8,779
Exports all oils	232	275	568	430
Total demand	9,748	9,358	9,386	9,209

UNITED STATES—Supply and Demand of All Oils
(Thousands of Barrels)

Year	USA Domestic Supply	Imports	Exports	Year-End Stocks	Domestic Demand	% Change	Total Demand	% Change
1956	2,970,514	525,591	157,386	780,391	3,213,187	+3.77	3,370,573	+4.33
1957	2,912,843	574,589	207,187	841,317[1]	3,218,619	+0.44	3,425,806	+1.92
1958	2,744,152	620,589	100,638	788,796[2]	3,315,213	+3.01	3,415,851	—0.30
1959 est.	2,887,000	635,000	84,500	753,526	3,473,500	+4.77	3,558,000	+4.17

([1]) On new basis Jan. 1, 1958, as 839,906.
([2]) On new basis Jan. 1, 1959, as 789,526.

the first quarter, unfinished oil imports averaged 137,000,200 b/d, after which the average was reduced more than 50%.

Residual-oil imports were cut in half after the first-quarter import level of 932,400 b/d, and imports of other refined oils fell from 189,900 b/d in the first quarter to 92,000 b/d in the third quarter.

Crude-oil prices were weak, especially in the case of higher-gravity crudes, despite the greater restrictions on foreign oil. Mid Continent 36-gravity crude was down 10 to 15 cents, and some East Texas crude was selling at 20 cents below 1958. West Texas crude was relatively more steady.

Bunker "C" oil postings were steady at the Gulf and in New York Harbor. No. 2 oil sagged in the summer. Motor-fuel prices closed the year a half cent above the opening quotations in Gulf cargo lots.

Natural Gas—Marketed production of Natural gas increased 4% in 1959, to 11,472 billion cubic feet, from 11,030 bilion cubic feet in 1958. The number of gas customers expanded at a faster rate than consumption. At the end of 1959, there were 32,220,000 customers of natural and mixed-gas utility companies compared with 31,242,100 on December 31, 1958. Of these, 11,800,000 were homes with central gas heating compared with 10,798,100 at the end of 1958. Customers were served by 595,600 miles of gas mains and gathering lines owned and operated by utilities, compared with 571,000 miles a year earlier. In addition to gas customers served by pipeline, there were nine million users of bottled gas.

Expansion of home heating with oil was at a slower rate than gas, as has been the case in recent years. At the en of 1959, it is estimated that 9,000,600 homes were equipped with oil-fired ceneral-heating plants. The total in 1958 was 9,281,349.

OIL LAWS

With 46 state legislatures and the Congress holding sessions, 1959 was marked by the introduction of a large number of bills affecting the industry. In state legislatures, some 7,000 bills were introduced which were of some concern to the oil industry and its customers.

Four states raised the gasoline taxes. New York and Ohio each added 2¢ per gallon, and West Virginia and New Hampshire 1¢ each. Bills to raise the gasoline tax in 11 states were defeated. The federal gas tax was increased 1¢ on October 1 for a 21-month period. Expiration is scheduled for June 30, 1961. Increases brought the national average up to 10.2¢ per gallon: 4¢ federal and 6.2¢ state.

Four states reduced the allowances made to distributors to cover losses and cost of collecting gasoline taxes. Many states considered bills to

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broaden exemptions. Utah enacted a refund law covering gasoline used for agricultural purposes.

Regulatory measures proposing public-utility controls of the industry were proposed in five states.

Ten states enacted laws forbidding the leasing of state roadside land for retail purposes (including filling stations). In all, 27 states now have provided protection against direct or indirect state control of gasoline sales on limited-access expressways.

Percentage depletion again was under attack in Congress. On June 25, the Senate rejected a proposal by Senator Douglas of Illinois to reduce depletion for oil and gas on a graduated scale to 15% from the present 27½%. Later in the year, the House Ways and Means Committee conducted a panel discussion on depletion allowance at which the oil industry made a strong presentation of the need for the present allowance.

The coal industry sought to recover lost markets by federal controls on the "end use" of oil and gas. A bill was introduced in Congress to form a 16-member committee to study a "National Fuels Policy." A coalition of labor, coal interests, and labor is expected to push the fight against oil and gas in 1960.

Depletion allowances on foreign production were under particularly violent attack. It is doubtful if the elimination of the depletion allowance on production outside the United States would increase federal revenues very much; however, the attacks have grown so rapidly that it is very likely the allowance will be removed for such production within the next few years.

FINANCIAL: Earnings of USA oil companies were sharply higher during the first half of 1959 compared with the same period of the recession year 1958. In the latter half-year, earnings were about the same as in the corresponding months the previous year. Earnings reports for the first three quarters were 16% higher, but in the third quarter the increase was only 1%.

Much of the improvement in profits in 1959 was due to a process of "belt tightening." Capital expenditures were postponed in many cases, and management in a number of major companies undertook a severe reorganization to reduce overhead. Outstanding examples were the merger of General Petroleum and Magnolia into the Socony Mobil organization, and the merger of Carter Oil, Esso Standard, Pate, and Oklahoma Oil into Humble Oil & Refining Co.

In addition to corporate realignments for more effective operations, there was a general tendency to reduce employment in the intermediate management group through failure to fill vacancies and by means of early retirement. Goal of a number of companies was to reduce employment in middle management and clerical staffs by about 10%. Field forces also were kept at a minimum for effective operations, partly through improvements in automation. As a whole, the industry was seeking to repeal Parkinson's law, which states that staff employment in modern business expands at the rate of 5% per year.

Capital expenditures by the USA industry totaled $5.5 billion in 1959 compared with $5.3 billion in 1958 and $6.4 billion in 1957. Production investment was up $200 million, refinery investment $45 million, while other branches of the industry spent less than in 1958.

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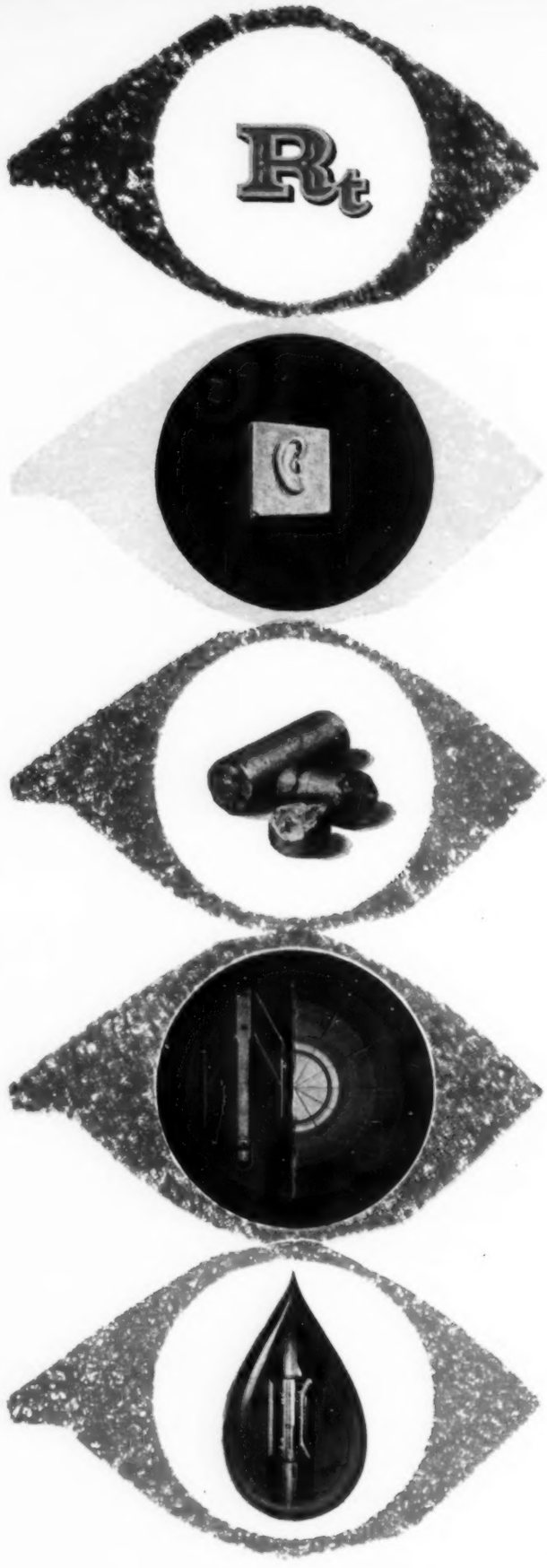

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EUROPE

EXPLORATION AND PRODUCTION: While no major oil discoveries were made in Europe, a series of small, profitable finds occurred in France. A detailed review is carried in appropriate country sections. The year was generally more distinguished for its contributions to transportation and, of course, marketing since Europe is one of the world's best crude-oil markets. Production of natural gas is rising rapidly (see *WPR 1959*, p. 65, for forecasts) and this will eventually cut into the ready crude market in the same way crude oil is cutting into coal sales in Europe generally today.

PIPELINES AND REFINERIES: Principal line to be built is a 465-mile crude-oil pipeline from Lavera, France, to Strasburg in France and to Karlsruhe in Germany (see map). The company responsible is known as Piseur; its operations are already under way —with start of the line's operations tentatively estimated as January 1, 1963. The company was founded by 19 French, German, Dutch, Belgian, British, and USA companies, including California Texas, Mobil Oil, and Esso Standard. The 19 include most of the large petroleum groups which today supply Western Europe. Cost is estimated at 60 billion francs, or about US $120 million. Starting capacity will be 10 to 12 million tons of crude oil a year (200,000 b/d to 240,000 b/d), with two pump stations, and the capacity may be doubled by 1975 with the expenditure of an additional 10 to 15 billion francs.

The French hope that 75% of the crude for the line will come from the Sahara, with the rest from the Middle East, much of it from Iraq. Other pipelines are in the planning stage for Europe. The Germans are considering one from the North Sea to southern Germany. An Italo-Swiss project, to start at Genoa and to reach to Munich in southern Germany, is under study.

MARKETING: Oil demand in Europe, which faltered in 1957 after the Suez crisis, has begun to revive. As accompanying tables show, demand in 1958 averaged about 15% over 1957, and 1959 did almost as well with an estimated demand increase of about 10%.

Expected demand was for 3½ million barrels daily in 1959 in Western Europe and 2.6 million barrels daily in the communist zone. Communist domestic demand for 1959 was forecast at 11.6% more than in 1958, while the rate of growth in capitalist countries probably will have been 10.6% in 1959.

EUROPE—Estimated Oil Use in 1959
(Thousands of Barrels of Crude-Equivalent Daily)

Austria	45.6	49.6	8.8
Belgium & Luxembourg	135.7	142.6	5.1
Denmark	85.7	93.6	9.2
Finland	34.5	37.0	7.3
France	483.7	520.5	7.6
Germany (West)	428.1	504.9	17.9
Gibraltar	6.4	6.6	3.1
Greece	37.3	40.9	9.7
Iceland	6.4	6.8	6.2
Ireland (Eire)	25.2	26.9	6.8
Italy	329.5	369.7	12.2
Netherlands	197.4	216.0	9.4
Norway	63.0	65.7	4.3
Portugal & Islands	32.4	32.9	1.5
Spain	108.9	115.7	6.3
Sweden	202.0	217.7	7.8
Switzerland	64.8	66.8	3.1
United Kingdom	734.0	837.5	14.0
Yugoslavia	21.5	23.2	7.9
USSR and Satellites	2,353.0	2,625.0	11.6
Total Europe	5,556.0	6,159.4	10.8

EUROPE—Oil Demand in 1958
(Thousands of Barrels Per Day)

Country	Estimated Consumption	% Increase
France	385.0	8.2
West Germany	353.0	22.2
Italy	273.0	15.1
Netherlands	126.0	23.6
Belgium	112.0	14.5
Luxembourg	4.0	14.1
Total—European Economic Community	1,253.0	14.5
United Kingdom	578.0	15.4
Total	1,831.0	14.8

In Great Britain demand for 1959 reached 837,500 b/d, an increase of 14% over 1958. Much of the expansion in oil consumption in Britain may be attributed to the growing use of oil as fuel for power plants to replace coal.

On the continent, Germany continues its amazing industrial growth which is paralleled by a similar rise in fuel-oil demand. An increase of 17.9% brought oil use in Germany to more than a half million barrels daily, only about 16,000 b/d below France.

The French economy shows a healthy growth in oil use of 7.6%—to 520,500 b/d—but France probably will yield second place to Germany in 1960 as the largest oil consumer in Western Europe. One reason for this, of course, is the rapidly increasing production of natural gas in France. In Portugal a very minor oil demand growth occurred in 1959.

OIL LAWS

The principal changes in oil laws occurred in Spain, where a completely new petroleum code was adopted (see Spanish section for review). No significant changes were made in any other countries other than in the Trentino-Alto Adige region of Italy, which passed a separate petroleum law similar to Sicily's.

All major oil statutes for Europe have been translated and bound in a series of volumes entitled *"Europe—Basic Oil Laws and Concession Contracts."* They are available from *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

The principal national developments were the solidification on Europe's return to currency convertibility and the area's undeniable economic strength. An important development is under way with delegates of six countries forming the European Economic Committee (Euromat) to decide on tariffs for oil imports.

AUSTRIA

EXPLORATION: The first oil in Austria was struck, August 30, 1930, financed by French and German capital. The first commercial well, drilled with Swiss capital, came in on August 21, 1934. Later RAG, founded by Shell and Vacuum Oil, and the Canadian company R. K. Van Sickle, began drilling. German capital moved in during the World War II annexation of Austria. After World War II, "German assets" were seized by the Russians and sold to Austria in 1955. Claims of western oil firms for losses suffered during 1938-45 were acknowledged in the *Vienna Memorandum* of 1955. A final settlement was nearly achieved by the end of 1959.

In 1959 the State company, OeMV, invested US $20.5 million (1958: $26.9 million), of which construction of the new Schwechat refinery took $9.7 million, exploration $5.7 million, and production installations $2.7 million. Footage drilled in 1959 totaled 164,050 ft for exploration, 127,073 ft for production, 32,252 ft for extension, 31,005 ft for water injection, and 32,810 ft for structural tests.

OeMV had four seismic crews in the field throughout 1959. Seismic and gravimetric surveys concentrated on prospective areas in the Vienna basin. Exploratory well Aderklaa 71 discovered a gas horizon at 9,257 ft, the first gas found in the Triassic with relatively high pressure for Austria of 4,260 psi, compared with 2,130 psi in Zwerndorf gas field. Shot perforations in exploratory well Althoeflein 1 between 738 ft and 761 ft opened a gas horizon in the Tortonian. This led to the discovery of a new gas field which can be put into production any time. The gas yield of the promising Moosbierbaum K6 well soon fell off. OeMV was fortunate in discovering gas, but the expected oil finds did not materialize.

Jointly with British Petroleum Exploration Co. Ltd., OeMV is prospecting in the Scheibbs concession area. Wildcat Texing 1 looked promising at the year's end.

The first wildcat in Austria's westernmost province was spudded in 1959 by the West German Preussag Corp. for Vorarlberger Erdoel. Located at Lauterach Ried, near Dornbirn, the well is to be drilled to 8,203 ft. Preussag is drilling at its own expenses, but will share in profits if the well is productive.

Exploration by RAG: RAG activity is concentrated on the province of Upper Austria, since well Uebersbachll, Styria province, was abandoned in January 1959 at 8,832 ft. At the beginning of 1959 RAG had two wells in Upper Austria: Puchkirchen 1 and Steindlberg 1. Dur-

(*Continued on page* 184)

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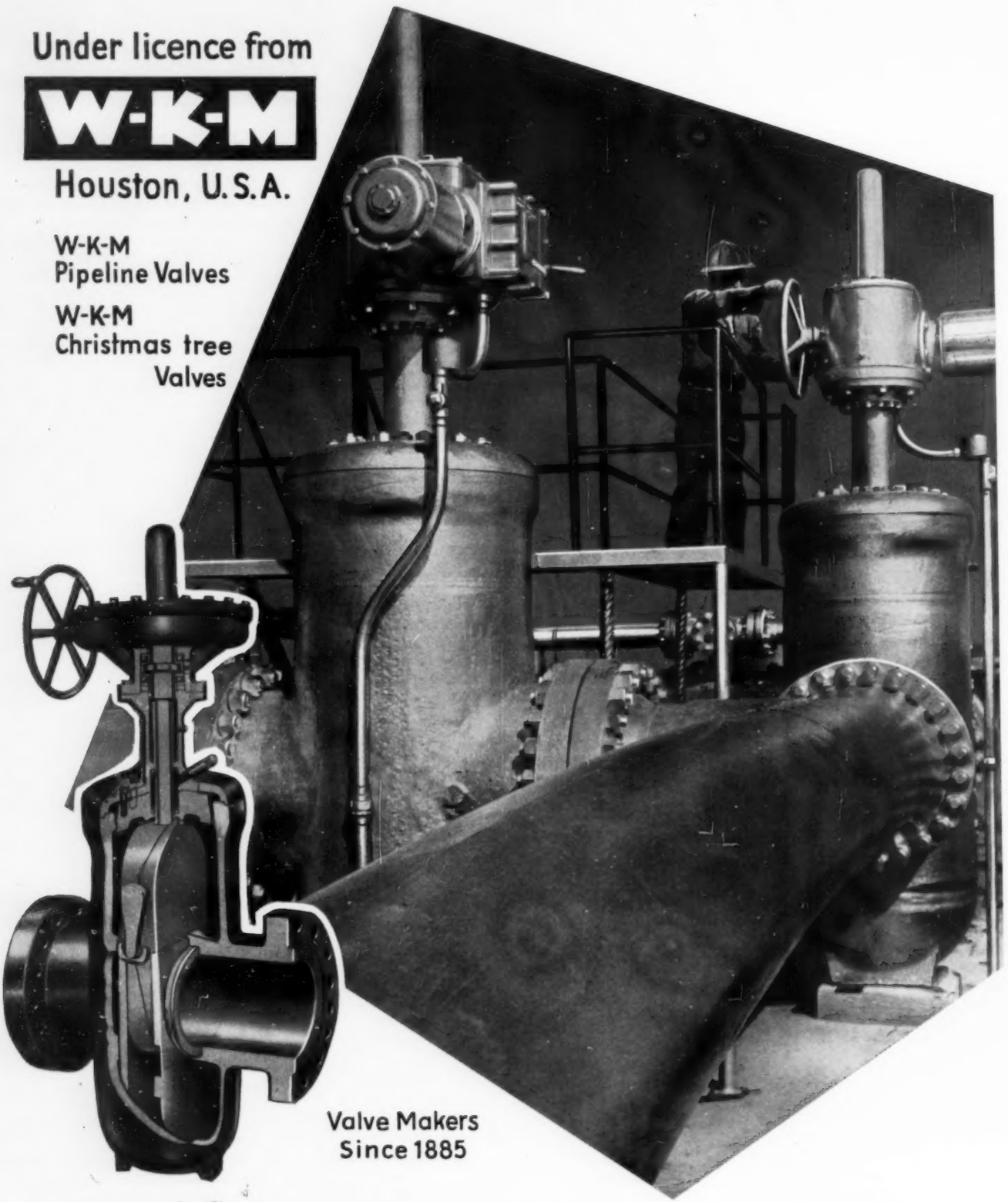

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VEREINIGTE ÖSTERREICHISCHE EISEN- UND STAHLWERKE, LINZ, AUSTRIA

ing 1959 five more wells with differing productivity were added. Puchkirchen 3 reached 8,900 ft in January 1959. Production tests yielded oil from two horizons in the Upper Eocene. Meanwhile, its oil flow has become irregular, and water content has risen to 80%. Tests of the deeper horizons were made in September. Puchkirchen 4 was abandoned in May at 8,964 ft, since cores showed only oil traces. Ried 1 was completed in March at 4,567 ft; a test between 4,160 ft and 4,508 ft yielded oil (without water) from the Upper Eocene. Steindlberg 2 reached its final depth of 6,431 ft in June; since August it has been pumping about 4.4 tons (33 bbls) of oil daily. Ried 2 was competed in August at 4,600 ft; it is blowing oil at about hourly intervals from the Upper Eocene. Ried 3 was completed in September at 5,938 ft; oil shows were encountered at the same level as in Ried 1 and 2. Lohnsburg 1, drilled to 6,440 ft, was abandoned in August. Ried 4 struck oil in November. Pattigham 1 was rigging up at the year's end. Seismic surveys were carried out by RAG at Attnang-Puchheim and at Ried.

PRODUCTION: Cumulative crude production since 1930 is 37,766,023 tons. Highest production was in 1955 (3,666,112 tons). Crude production dropped in the following years by 6%, 7.6%, 12%, and 15% (estimated). On the other hand, gas production has been rising. It was 26,783,536,402 cu ft in 1957, 28,964,295,129 cu ft in 1958, and 38,386,341,378 cu ft (estimated) in 1959.

Three companies participate at present in Austria's oil production: the nationalized Oesterreichische Mineraloelverwaltungs AG (OeMV) (Austrian Mineral Oil Administration Ltd.), which accounts for about 95% of Austria's crude output; and two private firms, Rohoelgewinnungs AG (RAG) (Petroleum Recovery Ltd.) and R. K. van Sickle. Erdoelproduktions-GmbH (EPG) (Petroleum Production Corp.) was merged during 1959 with OeMV, which had owned 50% of the stock.

Reserves: Proved oil reserves in Lower Austria province are estimated at 49 million tons (about 332,612,000 bbl); gas reserves are estimated at 978.08 billion cubic feet as of January 1, 1959.

TRANSPORTATION: There are at present 132 miles of 7.8-in. to 11.7-in. oil pipelines supplying the Korneuburg, Schwechat, and Lobau refineries with crude from oil fields in the province of Lower Austria. While the net length of oil pipelines has remained the same for some time, the net gas pipeline mileage has been extended in recent years to meet the rising gas yield. Niogas, founded in 1954, now has 447 miles (270 miles of trunk lines, 177 miles of branch lines).

OeMV intends to build a second suspension bridge across the Danube for 13 pipelines leading to and from the new Schwechat refinery. The bridge is scheduled for completion in April 1960.

REFINING: The primary processing capacity of Austria's eight refineries remained unchanged at about 2.4 million tons per year (about 48,000 b/d) during 1959. Private companies (Shell, Vacuum, van Sickle) own about one-fifth of the capacity. The Lobau refinery (18.8%) was leased in June 1958 by its owners, Shell and Vacuum, to the State company OeMV, which thus disposes of the remaining 80% of throughput capacity.

Vacuum Oil Co. (refining) and Mobil Oil Australia AG (marketing) were merged during 1958 into Mobil Oil Australia Aktiengesellschaft. The company completed a grease plant and a barrel reconditioning plant at its Kagran refinery.

OeMV's largest investment project is the Schwechat refinery, begun in March 1958. Capacity is 150 to 200 tons per day. Construction of the atmospheric distillation plant is nearing completion. This refinery is to replace eventually OeMV's four refineries, which are operating at a loss and are obsolete.

MARKETING: As a result of the steady decline in domestic crude production, imports are rising continuously. Total 1958 consumption of products was 2,087,709 tons, of which 1,363,426 tons came from domestic production and 724,283 tons from imports. The corresponding figures for 1959 are estimated at 2,302,800 tons, 1,518,100 tons, and 784,700 tons, respectively. The rate of increase in consumption of petroleum products was 12% in 1958 over 1957, and is estimated at 10% in 1959 over 1958.

The rising share of imports in Austria's total oil supply is not only attributable to the decline in domestic production, but also to the inability of the obsolete refineries to meet market requirements.

AUSTRIA—Oil Consumption
(Metric Tons)

	FROM DOMESTIC SOURCES		IMPORTS		TOTAL CONSUMPTION	
	Est. 1959	1958	Est. 1959	1958	Est. 1959	1958
Motor gasoline	266,000	219,211	253,000	208,801	519,000	428,012
Aviation gasoline	7,600	6,635	8,100	7,126	15,700	13,761
Kerosine	15,400	15,571	—	—	15,400	15,571
Gas oil	440,000	393,859	8,000	5,929	448,000	399,788
Heating oil	660,000	619,237	440,000	434,260	1,100,000	1,053,497
Lubricating oils	53,100	52,055	31,600	30,381	84,700	82,436
Bitumen	76,000	56,858	44,000	37,786	120,000	94,644
Total	1,518,100	1,363,426	784,700	724,283	2,302,800	2,087,709

OIL LAWS

Exploration, production, processing, and marketing operations in Austria are subject to at least 17 legal instruments. This thicket of international treaties and Austrian laws, going back to the end of World War I, complicates the legal situation.

The German Bitumens Law of August 31, 1938, decreed that a drilling concession expires if no oil field has been developed by July 31, 1940. After the latter date, concessions were granted mainly to German companies. This procedure gave rise to the notion of "German assets," as first defined in the Potsdam Declaration of August 2, 1945. Previously the London Declaration of the UN of January 5, 1943, declared null and void all transfers of rights and properties by government which were at war with the allied powers. In 1946, Austria issued the Nationalization Law which nationalized the whole oil industry *de jure*. This was followed by the "statement" of the Austrian government of September 7, 1946, by which companies whose owners are citizens of UN member States will not fall under this Nationalization Law until a settlement has been reached concerning restitution or indemnification. In the *Vienna Memorandum* of May 10, 1955, the Austrian government acknowledged the claim of USA, British, and French firms to restitution or compensation for rights and property possessed prior to March 13, 1938.

AUSTRIA—Production, 1959

MONTH	OIL (Metric Tons)	GAS (Thousands of Cubic Meters)
January	219,972	106,862.1
February	190,876	100,310.5
March	207,300	103,111.3
April	201,600	91,879.7
May	208,703	70,270.2
June	201,938	70,601.7
July	205,650	67,628.2
August	205,650	68,081.9
September	200,081	78,778.2
October	205,000 (est.)	98,800.0 (est.)
November	200,000 (est.)	108,800.0 (est.)
December	210,000 (est.)	122,000.0 (est.)
Total	2,459,489 (est.) (45,740 b/d)	1,087,123.8 (est.)

GREECE

EXPLORATION: On May 31, 1958, the German firm of C. Deilmann Bergbau GmbH terminated its exploration in Greece (see *WPR 1959*, p. 84) and its activities with the local "Hellenic Sun" Oil Field Exploration and Development SA. All three wildcats drilled were dry, all on the Tavri anticline. A concession map is given in *WPR 1959*. Some exploration was done by the USA industrialist, W. H. Helis, in the northwestern part, several years ago.

During 1959 a concession was applied for by Standard Oil Co. (New Jersey). It covered extensive areas in the south, including some islands offshore, and was still under consideration by Parliament at the year's end.

PRODUCTION, REFINING, MARKETING: The new oil refinery near Athens (see *WPR 1959*, p. 84) began operations in accordance with the contract signed on August 8, 1958, between the Greek government and Transportation, Trade & Refining Oil Co. A new firm, the Greek Petroleum Refineries SA, was incorporated on November 24, 1958, for a period of 10 years. The articles of incorporation of the firm assign to it the operation and management of the State-owned refinery. The capital stock of the corporation (which totals 4,800 shares) is controlled by Stvros Sp. Niarchos (4,128 shares, or 86%); Socony Mobil Oil Co. Inc. (480 shares, or 10%); and Demetrius Carapanos (192 shares, or 4%).

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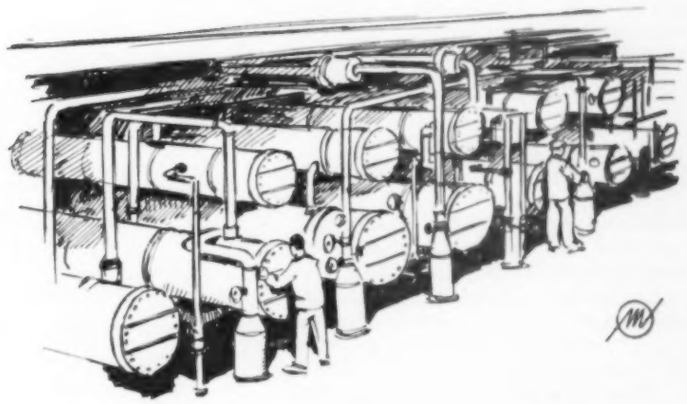

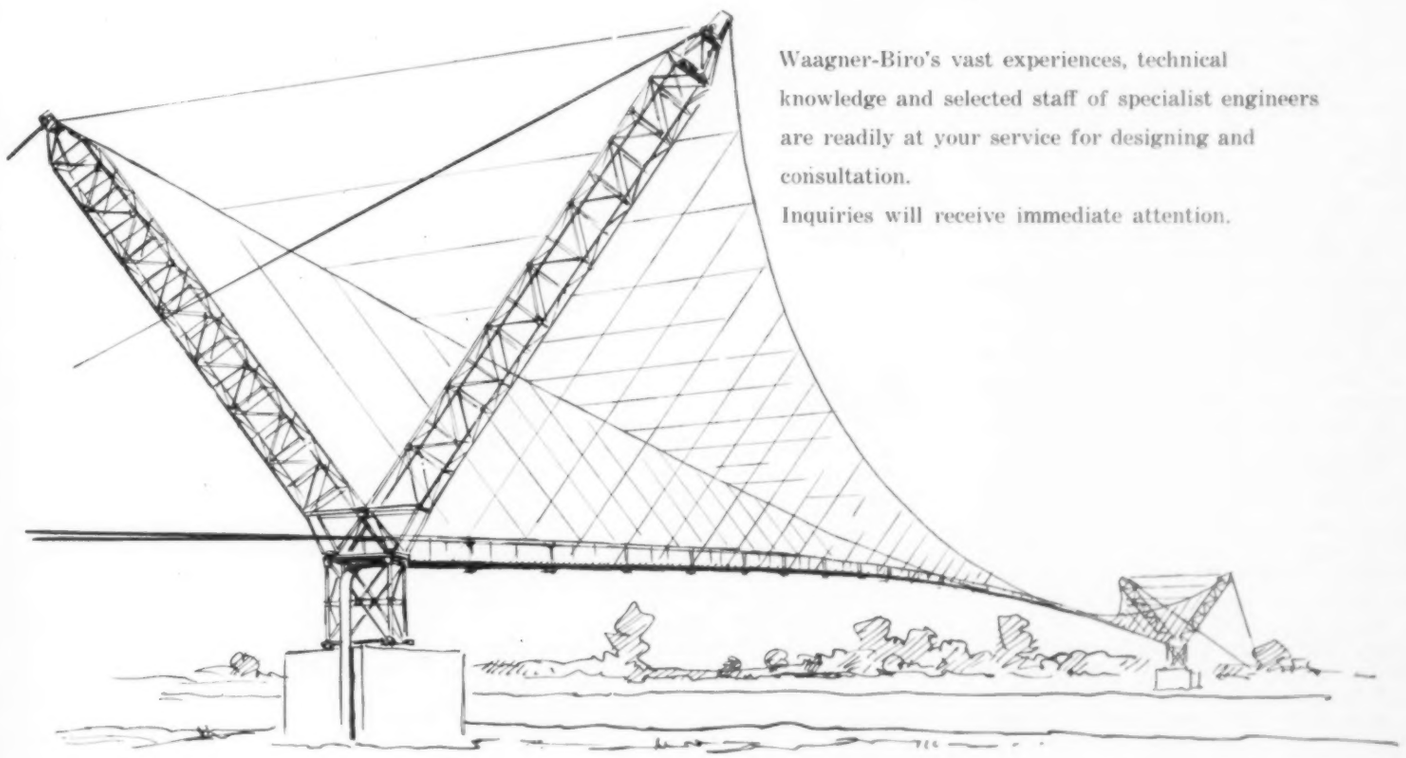

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GREECE—Suppliers of Petroleum Products, 1958

Country	Percentage
Italy	27.85
USSR	16.86
France	13.72
Aden	10.85
Saudi Arabia	10.82
United Kingdom	5.36
Romania	5.22
United States	3.35
Kuwait	2.43
Netherlands West Indies	1.39
Bulgaria	0.52
Iran	0.48
Netherlands	0.43
Spain	0.16
Other countries	0.56
	100.00

OIL LAWS

On April 10, 1959, a new petroleum law was signed. It was considerably changed from the draft law as published in *WPR 1959*, p. 86; most of the changes were at the suggestion of A. Rousseau, a French OEEC expert on petroleum legislation. The law's principal defects are [Art. 11(6)] that no surrenders may be made during the exploitation period except on "exhaustion of the deposits"; the severe exploitation obligations (Art. 13); and the unclear forfeiture provisions in Art. 25.

NORWAY

There is no exploration or production. A 40,000 b/d refinery is under construction for A/S Esso-Raffineriet Norge, at Slagen; the only other plant is a 2,100 b/d skimmer also owned by Esso.

Inland consumption of petroleum products in 1958, at 2,877,000 metric tons, was 20% higher than in 1957, but only slightly higher than in 1956, due to the international economic recession. Inland consumption of gasoline rose to 380,000 tons in 1958, gas-diesel oils to 956,000 tons, and fuel oil to 1,216,000 tons.

NORWAY—Imports, 1958
(Thousands of Barrels)

Crude petroleum	580
Gasoline	3,258
White spirit	112
Kerosine and jet fuel	1,288
Gas oil	5,117
Diesel oil	2,999
Light fuel oil	916
Heavy fuel oil	7,680
Lubricating oil	210
Paraffin wax	15
Petrolatum and grease	15
Asphalt (incl. natural)	214
Pitch	143
Coke	380
Other oils	9
Total	22,936

Source: US State Dept., Oslo.

CYPRUS

There has been little activity in the country, since political unrest has slowed government consideration of the application by Forrest Oil Corp. for an exploration contract. The contract still has not been ungranted, and the company has limited its activities.

OIL LAWS

No changes occurred in basic regulation during during 1959. The Model Exploration, Prospection, and Mining Lease issued by the British Colonial Office is used for new agreements. Copies of these documents are available from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

FINLAND

There is no exploration nor production. The country's single refinery is described in *WPR 1959*, p. 81. There have been no additions to the Oil Laws, as reviewed on that same page.

MALTA

British Petroleum Co. has given up its license in Malta, and no exploration is under way. The company drilled its last well at Naxxar, abandoning it late in 1959.

SICILY

EXPLORATION: In 1959, the major share of exploration was by ENI, followed by Gulf Italia, Montecatini, Edison, and Snia Viscosa.

ENI, through AGIP Mineraria and affiliated companies, is prospecting and drilling in the Gela oil concession, where 30 producing wells have been completed. Gela No. 21 and Gela No. 28 are two offshore producing wells. The size of this field is growing; but, unfortunately (from a sales viewpoint), the crude is very heavy, bituminous, and highly sulfurous. ENI is drilling also at Ponte Dirillo, Gagliano, Sicili, Mineo, Marineo, and Pattino. Latest evaluation of Gela proved reserves indicates about 25 million tons (175 million barrels, approximately). Capacity of Gela, according to statements by Mr. Mattei, is three million tons per year (60,000 b/d).

Gulf Italia continued study of its oil concession at Ragusa, where 50 wells had produced, as of October 8, 1959, four million tons of crude since discovery.

CISDA (Compagnia Idrocarburi Sicilia D'Arcy), a BP affiliate, gave up its Victoria permit, where in 1954 it found a very heavy oil (gravity, 8 API). After a number of production tests, CISDA decided to withdraw, since development appeared uneconomic.

BP's withdrawal did not discourage other companies. The French company Petropar signed an agreement with Ausonia Mineraria for work on permits in Sicily, and the German company Preussag concluded an exploration agreement with Cosip, Siliape, and Silipe.

Ausonia Mineraria, associate of the Edison group, drilled eight wells for a total of 9,400 meters. Ausonia is operating in Sicily jointly with Lion Oil Co., of Houston, Texas.

As of the end of October, there were granted in Sicily permits covering about 1,672,000 hectares. Concessions numbered three, covering 59, 306 hectares. AGIP Mineraria has requested three other concessions of about 27,800 hectares, covering the extension of the Gela field, the Lippone gas field, and small gas discovery at Mazara del Vallo.

PRODUCTION: Output of Gela has been limited, notwithstanding the potential of the field. While Ragusan crude has outlets in and out of Italy, Gela's crude is difficult to process, since it yields roughly 75% asphalt and has a sulfur content of 8%. ENI plans to build a plant at Gela to process this crude by coking. After coking, the output (23%) will be used to feed a thermoelectric power station, while the purified and upgraded liquid and gaseous fractions will be refined to produce petroleum products or sent to a petrochemical plant similar to that at Ravenna. Investment will require over 101 billion lire.

Reserves: Recent government evaluations show that the proved reserves of both the Sicilian fields are 25 to 30 million tons for Gela and 20 million tons for Ragusa.

Estimated crude production in Sicily for 1959 was around 1,620,000 tons (32,400 b/d), including 1,400,000 tons from Ragusa and about 220,000 from Gela.

SICILY—Crude Production

	First 11 Months 1959	Forecast 1959
ENI (Gela)	209,694	220,000
Gulf (Ragusa)	1,239,463	1,400,000
	1,449,157	1,620,000

REFINING: Refining capacity in Sicily amounts to 17.5% of all Italy. So far the only refining is in the RASION plant which at present can process over five million tons annually. Crude is supplied in part from Ragusa through a pipeline running from the field to the terminal at Punta Magnisi, near Augusta, but the major portion comes from the Middle East. Other oil processing plants are at Gela(a small asphalt plant) and at Ragusa for petrochemicals.

ANIC, the chemical affiliate of ENI, plans at Piana del Signore, near Gela, the mentioned large refinery and chemical facilities for a coking plant, a thermoelectric station, a sulfur unit for Gela crude, and several other petrochemical units to produce fertilizers, plastics, etc.

In the past few years a steady petrochemical development has taken place in Sicily. Celene Co. (Edison group and Union Carbide Corp.) has under construction at Priolo (Siracusa) a modern plant to produce polythene, ethylene oxide, and ethanolamines. Annual capacity will be 25,000 tons, with a possible expansion by 40%. The feeding charge will be supplied by a plant almost completed by SINCAT, which will process Ragusan crude to obtain olefins, ammonia, propylene, and ethylene. Another plant is being completed by ABCD (Asfalti Bitumi Cementi e Derivati) near Ragusa. This latter company will process in its new plant 200,000 tons of Ragusan oil to make polythene on German licenses.

Construction of a refinery at Milazzo by Mediterranea Raffineria Siciliana SpA and another at Palermo by ISLOM Co. has not as yet started, probably for economic reasons.

NATIONAL FACTORS

The regional government's favorable attitude toward investment by international companies has not substantially changed, although the present regional administration shows a growing preference for the State oil agency. It is supported by leftist political parties.

The number of skilled oil workers is increasing due to training by national and foreign companies.

FRANCE

1959 was a most important year for the French petroleum industry. An outstanding event was the inauguration on December 5, 1959, of the Hassi Messaoud-Bougie pipeline which will carry 165,000 b/d in 1960. Two new oil fields were discovered in the Parisian basin of metropolitan France, and one in southwestern France. Three of the fields discovered in the Parisian basin in 1958 were developed and proved to be commercial.

In the refining field, the outstanding event was the inauguration of the Bordeaux refinery of Esso Standard SAF, which was put onstream in April. Other companies have added units, bringing France's total refining capacity to 775,000 b/d. Daily production in metropolitan France averaged 32,400 b/d, or about 8% of total consumption. In the whole French community, production for the first 10 months of 1959 reached 2,646,000 tons, an advance of 36% over same period in 1958. Due to the deliveries of Saharan crude in December, a sharp rise brought total production of the franc zone in 1959 to about four million tons.

Gas production in metropolitan France soared to 10 millions cubic meters per day (330 million cubic feet per day). The gas-distribution system, 1,550 miles long from Lacq gas field to Paris, Lyon, and other main consuming centers, has been completed. It is the second largest in Europe.

In the Gabon, in West Africa, 626,520 tons of oil were produced in the first 10 months of 1959. A new structure was discovered at Rembo Kotto, in a region where Mobil Oil shares an undivided 50% interest with CPAEF.

In the Sahara, exploration became active toward the end of the year, with more companies entering the search. A new structure, Hassi El Gassi, was found by SNPA. CREPS had two more finds, and older discoveries were confirmed. Development has been active. Hassi Messaoud had 52 producers out of 55 wells drilled; Edjélé, 75 producers out of 80 wells drilled; Zarzitine, 49 out of 52; Tiguentourine, 15 out of 16.

By the end of the year, 482 wells had been completed—accounting for about 870,000 meters drilled. Nearly half of this was in metropolitan France.

EXPLORATION: The search for oil was greater than ever in the French community in 1959, calling for expenditures of 114 billion francs (US $271 million). Total expenditures (including equipment for exploration, exploitation, and transport) in the producing industry amounted to 250 billion francs. Of this, 84 billion was spent in France; 146 billion went to the Sahara and North Africa; and 20 billion to other franc-zone countries. 27,000 persons are now employed in research by oil companies, including drilling contractors, geophysics, etc. 133 drilling rigs were in operation to complete 482 wells: in France, 230 wells; Sahara, 159; French community, 76; and Morocco-Tunisia, 17 wells. The 133 rigs include: 60 heavy, 49 medium, 24 light. The number of heavy rigs is being increased.

Drilling contractors now number 19. For the first time, in 1959, French drilling contractors began working outside the franc zone, both for French and foreign companies, in Libya.

FRANCE—Drilling in Franc Zone

Year	Wells Drilled	Meters Drilled
1959	482	870,000
1958	419	763,000
1957	310	501,000

55 seismic crews were employed at the end of 1959.

The Parisian basin is still the center of interest. In Coulommes, the initial discovery was developed while a related new structure was discovered northeast of the previous one. The pay averages 150 ft. This field has 34 wells, of which 21 were drilled in 1959. Each of 28 producers yields an average of 30 cubic meters per day (189 b/d). Total production in 1959 was 150,000 tons. Reserves are estimated at between 2.5 and 3 million tons. Average production should be over 200,000 tons per year (4,000 b/d).

1959 saw two new discoveries in the Parisian basin, St. Martin de Bossenay and Villemer. At the end of 1959, Montmirail had good shows. Chailly-Chartrettes (1958) is being developed successfully. Chateaurenard is being extended. Granville and Nangis have been abandoned after producing for a short time.

St. Martin de Bossenay was discovered in 1959 by COPESEP, a Royal Dutch-Shell affiliate. At the end of the year, four wells produced an average of 120 cubic meters per day. One was dry; and one is testing; a seventh is being drilled. Another well on the same permit, Rigny La Nonneuse (R.N. 1) seems to have found oil on a similar structure. St. Martin de Bossenay seems to be the best oil field in the area. It has the thickest pay in the Parisian basin, an average of 60 meters (200 ft).

Villemer, discovered by RAP, near Montereau, found oil in the Dogger and in the Lusitanian. The first well produced 46 cubic meters per day (290 b/d). The second well found the same producing formations of the Lusitanian and the Dogger (limestones).

Montmirail 2 (RAP) found oil at the top of the Dogger around 1,850 meters. It was testing at the end of 1959.

Chailly-en-Bière was discovered by Compagnie d' Exploration Pétrolière at the end of 1958, near the border of its permit with RAP. The field proved to extend over the border, and both companies were active in 1959 on development. Thus, the field is known as Chailly-Chartrettes. Total number of wells is now 27, of which 26 were drilled in 1959. CEP drilled 18 wells at Chailly, with 14 producers. RAP drilled nine at Chartrettes, with six producers. Production varies greatly from well to well, the average being 17 cubic meters at Chailly and 11 at Chartrettes. The best area seems to be along the border, in the center of the field where all wells yield around 50 cubic meters per day. The reservoir is complex. Definition of the field has not as yet been completed, and a northern extension is expected and will be explored. While reserves cannot be estimated as yet, production is expected to reach 200,000 tons in 1960 (about the same as at Coulommes). The producing horizon is Bathonian of the Dogger, between 1,650 and 1,700 meters. The pay averages 20 meters. Cumulative production was 31,000 tons for the first 11 months of 1959.

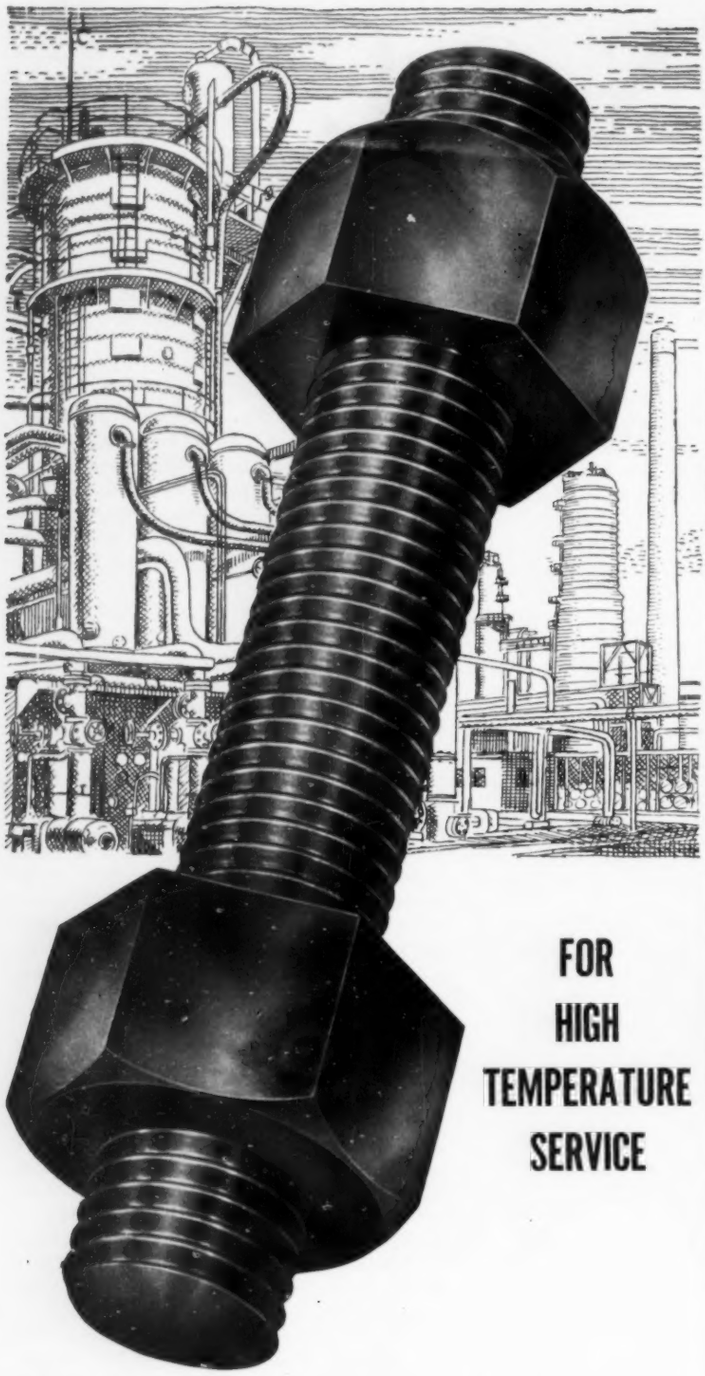
Chateaurenard discovered by Fropex (CEP 55%, Amoseas 45%) has drilled 10 wells, of which five produce an average of 15 cubic meters per day per well. Total production in 1959 was 15,000 tons. Fropex drilled six wells, of which three were producers in 1959. This field seems difficult to locate, but wells are shallow (1,830 ft), and productivity is fair. The same company had good shows while it drilled at Cheroy, 20 kilometers north of Chateaurenard.

In Aquitaine, in southewestern France, Parentis remains the best oil field, with 29 wells producing out of 37 drilled; five wells are for injection. Development was completed in 1958, and only two wells were drilled in 1959 for injection. Average production per well is 130 cubic meters, the pressure in the formation being kept up very satisfactorily by water injection (2,000 to 3,000 cubic meters per day). Total production in 1959 was 1,128,000 tons. Reserves are now estimated at 18 million tons.

At Mothes, Esso-Rep completed two more wells in 1959. This field now has four producers (out of seven wells drilled). Average production is 52 cu m per day. In 1959, production was 61,000 tons. A 6-in. pipeline will be linked in 1960 to the 12-in. pipeline from Parentis to Ambès refinery.

Esso-Rep drilled one well in 1959 at Lugos. This field has five producers, averaging 110 cubic meters per day. Cumulative production in 1959 was 32,400 tons. Lucats has only one well producing with 14 cubic meters per day.

Esso-Rep had a new find in this region in



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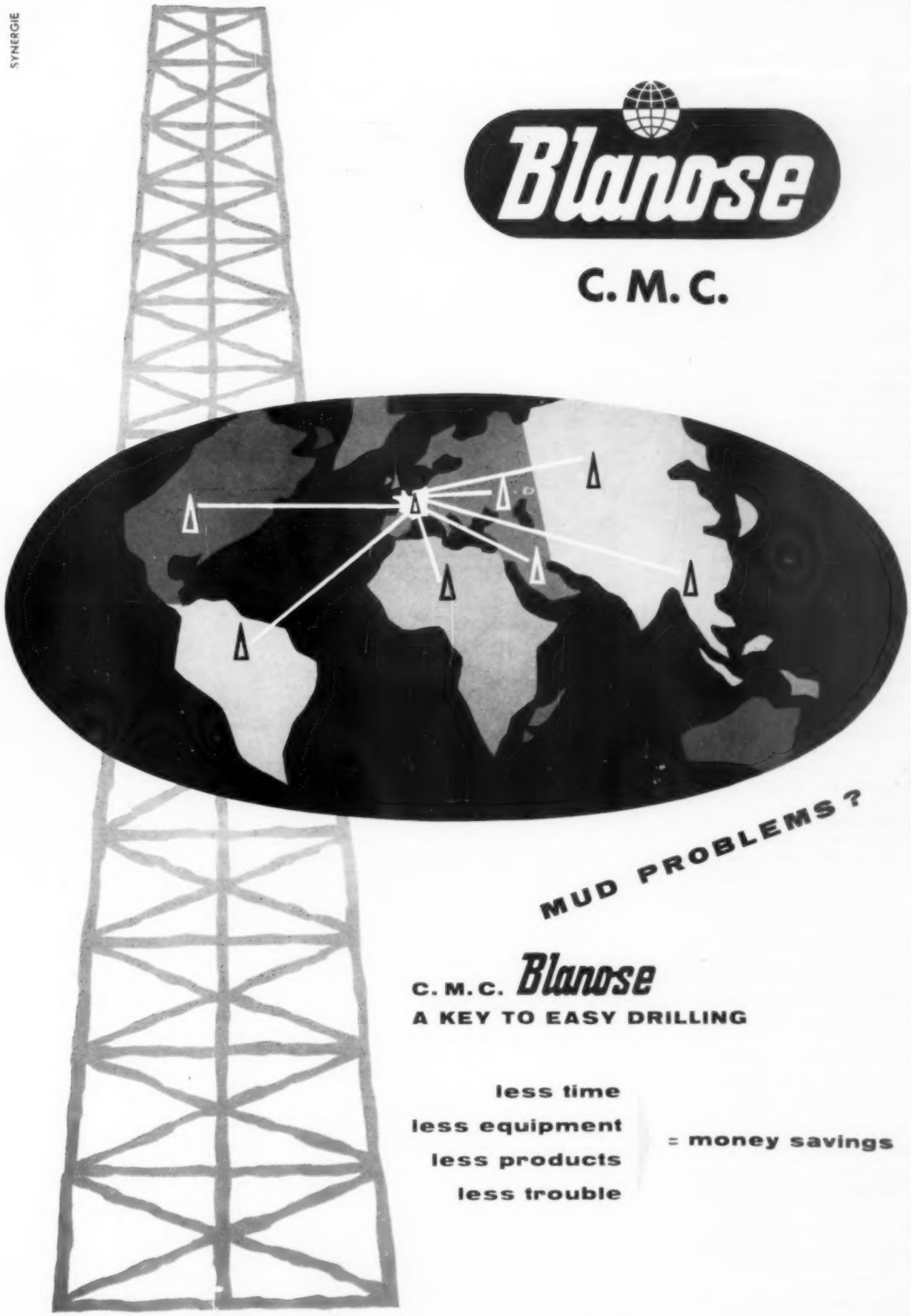

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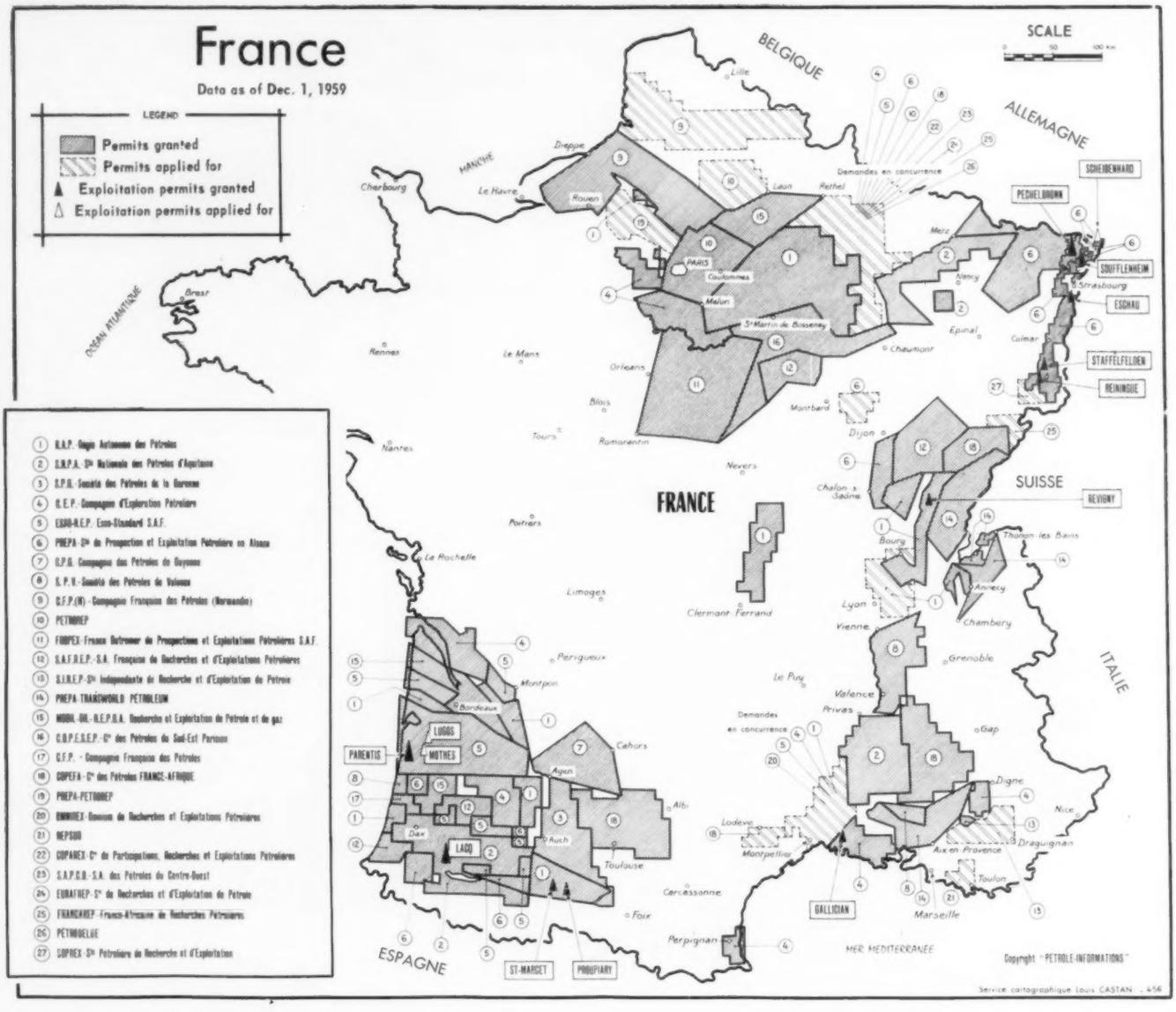


1959, at Cazeaux. Oil was discovered in sandstones of the Albian at various levels around 2,350 meters. A stepout, Cazeaux 2, found the same formation 150 meters lower. Both wells are now in production at the rate of 50 cubic meters per day, and a third is being drilled. Two heavy rigs will work on development of this field in 1960. Cumulative production in 1959 was 10,000 tons; it is expected to reach 100,000 tons in 1960.

PRODUCTION: Production levels are rising rapidly under the impact of continuing exploration in France. During 1959 it reached 1,620,000 tons, a 22% increase over 1958 levels.

Natural Gas: The most important gas field is Lacq, in the southwest, operated by SNPA. Lacq Superieur produces, in addition, about 100,000 tons of oil yearly.

25 wells have been completed at Lacq, 11 of them drilled in 1959. Average production is 500,000 cubic meters per day per well. Total production in 1959 was: raw gas: 2,260 million cubic meters; pure gas: 1,340 million cubic meters; sulfur: 415,000 tons; and liquids, 116,120 tons, of which 38,080 tons was LPGas.

The development of the Lacq field is nearing an end. In 1959, the number of heavy rigs employed by SNPA was reduced to two from seven. Development will be completed in 1960, after more drilling in the structure and completion of final wells.

Work on the underground reservoir of Lussagnet will soon bring injection capacity to 4.5 million cubic meters per day. Similary, construction of units for the treatment of sour gas has brought capacity to 10 million cubic meters per day. The last stage will take place in 1960, when capacity will reach 17.5 million cubic meters per day. Production of raw gas expected in 1960 is four billion cubic meters from 33 wells.

The trunk line of the 1,550-mile distributing system reached Paris at the end of 1959. Branch lines will be linked to the main line during 1960, and more are under study.

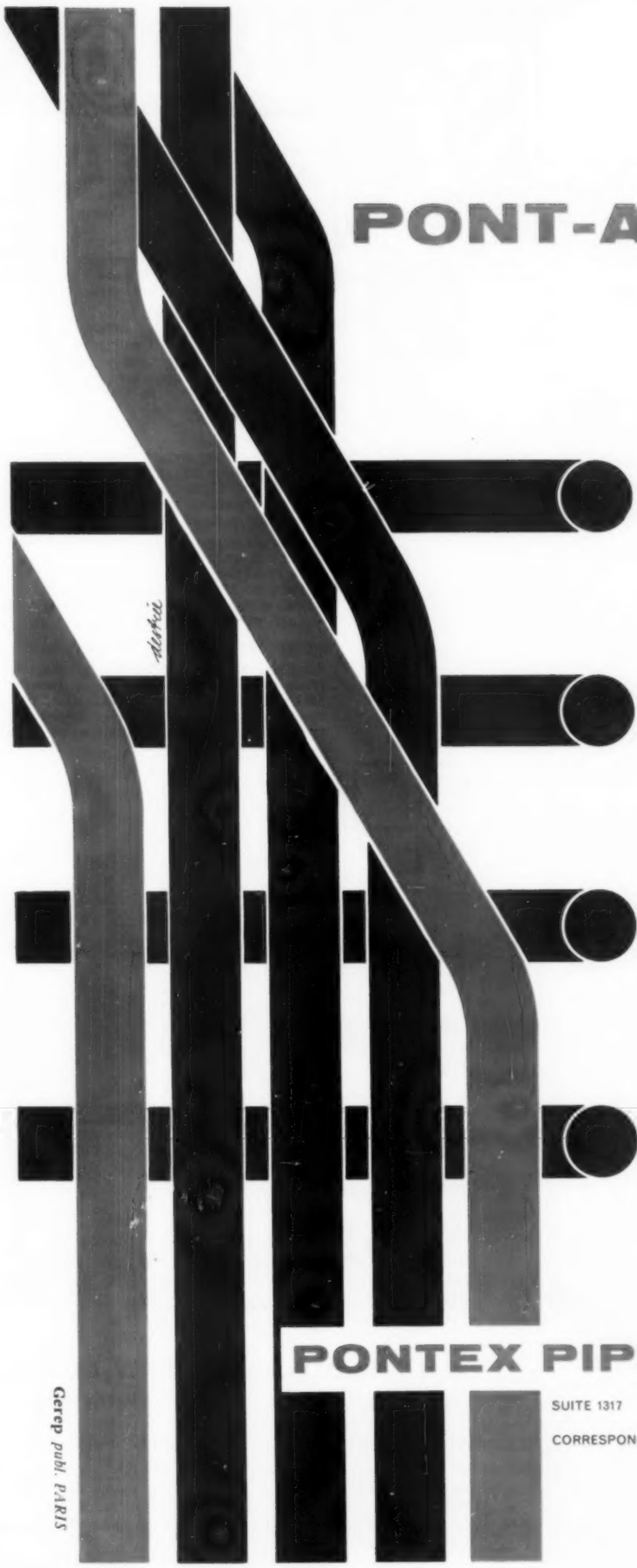
Two companies market Lacq gas: Compagnie Nationale des Gaz du Sud-Ouest (SNPA, 35%; RAP, 35%; Gaz de France, 30%). The second company is Compagnie Française du Methane—C.EFEM (SNPA 50%, Gaz de France 50%).

Production of treated gas should reach 13.3 cubic meters daily in 1961. It will be absorbed by industry (6 million); electricity (4.4 million), and Gaz de France (2.9 million).

The second gas field in France is St. Marcet, discovered in 1958 and operated by RAP. Its production in 1959 was 295 million cubic meters of treated gas and 24,600 tons of liquid products. This company made a discovery in 1959 at Charlas 1. Gas and gasoline were obtained from limestones of the Flysch and Lower Lias; 2,000 cubic meters per hour were produced on tests. Charlas is located three kilometers northwest of St. Marcet. This well was testing at the end of the year.

Other producers of natural gas in France are Esso-Rep: from Parentis about nine million cubic meters in 1959. Overseas, SEREPT (in Tunisia) produces about three million, and SCP in Morocco 6.5 million. In the Gabon (West Africa), SPAEF produces about 40 million cubic meters.

(*Continued on page 193*)



PONT-A-MOUSSON

FRANCE

SEAMLESS PIPE AND TUBES — COMPAGNIE DES TUBES DE NORMANDIE

WELDED PIPE
DUCTILE IRON PIPE
CENTRIFUGALLY CAST — SOCIÉTÉ DES FONDERIES DE PONT-A-MOUSSON

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REFRIGERATOR-TRUCK SERVICE

Problems raised by the transporting of fresh foodstuffs in the Sahara area have been solved by SHRM in close collaboration with the Louis ZHENDRE Tropical Refrigerating Constructions Works and the OMNI-TRANSPORTS Company.

EQUIPMENT

To ensure the full-time operation of their refrigerator-truck service, SHRM use 7 articulated trailer-type vehicles with a 53 m^3 capacity and handling a payload of 15 tons.

Each articulated trailer includes a heat-insulated storage unit with two refrigerated sections. The maximum and minimum temperatures of each container-compartment are adjusted to suit the storage requirements of the various categories of fresh foodstuffs normally carried.

SAFETY

Each cold-storage section of the heat-insulated refrigerator units is equipped with two interconnected compressors. Should either of the compressors go temporarily out of action, the other takes over and no damage is done.

Each truck is equipped with a radio set, so that the driver can, in the event of mechanical trouble, ask for a breakdown tractor to be sent out from one of the depots along the road. When the need arises, he can also cover a short distance himself on the scooter provided for such emergencies.

CONTINUITY

Thanks to the rational planning of this refrigerator-truck service, the foodstuffs go direct from the SHRM cold-storage plant in ALGIERS or ORAN to the containers of the heat-insulated refrigerator trucks and then to the cold stores of the reception centres at journey's end.

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AGENT : Tunis - Comptoir Tunisien d'Approvisionnements Généraux : 10, rue de Hollande - Phone 241.759

INFORMATION AND DOCUMENTATION ON APPLICATION

FRANCE—Imports 1958

(Thousands of Barrels)

IMPORTS (Crude Petroleum)	
United States	471
Venezuela	16,093
USSR	1,419
Iran	10,582
Iraq	62,010
Kuwait	58,852
Neutral Zone	2,708
Qatar	23,652
Saudi Arabia	28,032
Algeria	2,742
French Equatorial Africa	3,277
Total	209,838
EXPORTS	
Morocco	329

Source: Fascicule de Statistiques Pétrolières, Annual, 1958, Paris, through U. S. State Dept.

TRANSPORTATION: The main transportation system to date is the gas line from Lacq. It is the second largest in Europe, second only to that of Italy. An important products line is that from La Havre to Paris. A crude line was completed in 1958 by Esso-Rep to bring its Parentis crude to the new refinery near Bordeaux at Bec d'Ambès. A 6-in. pipe from Mothes will be linked early in 1960 to this line. In the Sahara, the "big inch" 24-in. 660-kilometer line from Hassi Messaoud was completed and in operation as of December 5, 1959. Another big line, from Edjélé to La Skhirra (Tunisia) is being laid. It should be ready by October 1, 1960.

Decision has been made to build a crude line from the Mediterranean to the Rhine. Four refineries will be built in Strasbourg and Karlsruhe, with an initial capacity of 10 million tons per year. Capacity should reach over 25 million tons in 1975. To deliver crude oil to these refineries, a new line was approved, October 14, 1959, by the French government, from Marseilles to Strasbourg. Length will be 750 kilometers; diameter, 30 in. to 42 in. Capacity will start at eight million (160,000 b/d) to reach 25 million, or 30 million, tons per year (500,000 to 600,000 b/d) later.

This line will be built by Société du Pipe-Line Sud-Européan formed by Antar Pétroles de l'Atlantique. Compagnie Française des Pétroles, Compagnie Française de Raffinage, Mobil Oil Française SAF, Caltex SAF, Compagnie de Raffinage Shell Bèrre, Société Française des Pétroles BP, Purfina Française, Deutsche Erdol AG, Gelsenberg Benzin AG, Mobil Oil AG, in Deutschland, Scholven Chemie AG, Withershall AG, Standard Oil Co. (New Jersey), Bataafsche Petroleum Matschappij NV, and British Petroleum Co. Ltd.

Consumption rose about 4.5% to 5% in 1959. Highest demands were on light fuels for domestic uses, which rose to 10%. Gasoline and light products, 3½%.

REFINING: On January 1, 1960, France's total refining capacity reached 38,750 million tons (about 775,000 b/d). This includes the new refinery of Esso-Standard SAF in Bordeaux (capacity 1,600,000 tons) and new units put onstream during 1959. Refineries have operated at an average of 80% of capacity (between 29 and 30 million tons).

Two new refineries are being built in Strasbourg, one by CFP-Antar (two 100% French companies), and one by Shell Bèrre-Caltex. (See *WPR 1959*).

Ste. Française de Pétroles BP has completed its new units in Lavéra, bringing total capacity to 104,600 b/d.

In Port Jérome, Esso put onstream a catalytic reforming unit and a steam-cracking unit.

In La Mède, (Raffinerie de Provence) CFR put onstream a catalytic reforming unit. This company is building distillation capacity at its Normandy refinery in Gonfreville to bring capacity up to 132,000 b/d in 1960, from present capacity of 72,000 b/d, mainly for Saharan crude (see *WPR 1959*).

Petrochemicals: The fabrication of petrochemicals has grown rapidly within France, as it has elsewhere. There are now 21 major plants; 11 new plants are under construction. For a detailed review of this subject, refer to the article beginning on p. 41 in the French section of *World Petroleum* (Vol. II) for June 1959 by Maurice Moulin, chairman of the Petroleum and Natural Gas Chemistry Section of the French Assn. of Petroleum Technicians (AFTP).

French Oil-Equipment Availability: A considerable amount of petroleum equipment is now available in France, most if it made to conform to standards set by the American Petroleum Institute. In the refining industry, 95% to 98% of equipment in operation in French refineries has been constructed within France. This includes, steels, nonferrous metals, controls, valves, etc. There are considerable French exports of refining equipment, including pressure vessels, fractionating towers, and even complete units (the Cubatao refinery in Brazil was completely made in France). The same is true of pipe for drilling, pipelines, etc. One of the most difficult jobs in the world was the successful fabrication in France of steel to withstand the high sulfur concentrations at Lacq gas field. Present production of pipe is now adequate to support a volume of exports. The same is true of heavy drilling equipment, about 90% of which is now fabricated in France.

OIL LAWS

During 1959 the oil laws for France (and the rest of Europe) were published in an unusually accurate and complete series of volumes entitled *"Europe—Basic Oil Laws and Concession Contracts (Original Texts)."* They contain word-for-word translations of French laws governing petroleum within France (the laws of French territories are included in another series dealing with Africa), most of which have never before been published, so far as is known. It is a highly recommended compilation. Inquiries concerning it should be sent directly to the publisher: *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.* The original volumes are kept up to date by addition of supplementary volumes containing new laws and/or concession arrangements.

No change occurred in French laws governing oil during 1959. For information and a summary of same, see *World Petroleum Report 1959*, p. 80.

Effective January 1, 1959, French taxes were increased by new legislation which upped the corporate tax to 50% from 45.6%. It also institutes an excess profits tax which, taking the average of the two best years in 1954, 1955 and 1956, institutes a 20% tax on profits over that level. The dividend withholding tax was increased as well, to 22% from 19.8%.

NATIONAL FACTORS

For a review of France's oil policy see *World Petroleum Report 1957*. For some time, the oil industry within France has been extremely closely regulated, especially as concerns marketing. The new plans for Saharan oil are, therefore, a change of technique but not of basic policy.

In an effort to introduce Saharan oil into the French (and other European) markets, the so-called "Jeanneney plan" has been introduced. As a first step, a new marketing company has been formed in France, made of entirely State-owned oil-producing companies and the BRP. The new company is called Société Industrielle des Pétroles. Participation in it will be BRP. 1/3; Régie Autonome dés Petroles 1/3; the last third being shared by SN Repal, SNPA, SPAEF, and some financing organizations. SN Repal, as a big producer in Hassi Messaoud, will receive 20%. RAP is the main shareholder of CREPS, with Edjélé and Zarzaitine fields. SNPA produces some oil from the Lacq gas field, and has already been successful in El Gassi in the Sahara. SPAEF exploits the Gabon oil field.

The new organization had conducted negotiations with the Caltex group French affiliate, Caltex SAF, which is selling its tankers, refinery, and marketing system to the newly formed State company, and will keep a minority interest, believed to be 40%.

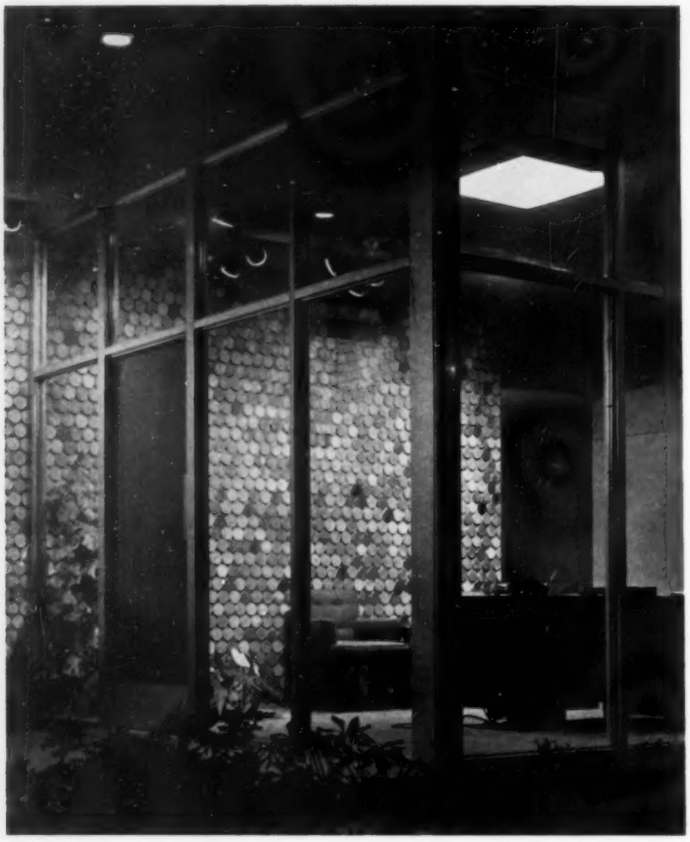
The Jeanneney plan would also unify all the numerous small French distributors. At the beginning of 1959, the French gasoline market represented 4,899,484 tons, of which only 196,211 were not affiliated with a big company. Most of the independents, including the bigger ones like Azur and Antar, rely on Compagnie Française de Pétroles for their supplies, since they have no production. The government project plans to include as many as possible of the independents into a new marketing organization, built up by SIP and Caltex.

It is suggested that those companies which resist absorption by the government marketing agency should be forced by law to buy at least half of their licensed capacity in Saharan oil.

The policy has infuriated the Compagnie Française des Pétroles, which was considered until not very long ago as France's main instrument for oil policy. Since the war, CFP has made considerable efforts to develop its marketing system, both at home and abroad. In the past few years, it has been engaged rather successfully in building new markets in numerous countries abroad: in Europe, Asia, and Africa. Ever since the first discoveries in the Sahara, CFP has made a costly effort to build new markets. Under the Jeanneney policy, CFP will be forced into competition with its main shareholder, the State.

A parallel effort is being made under the "Group II" discussions to introduce Saharan crude into Europe's Common Market. Initial efforts to gain a preferential position for crude failed; and Professor Erhard, minister of economics for Germany, stated that Germany would not give any assurance to France on the sale of Saharan crude in West Germany.

The new currency unit replaced the former franc on January 1, 1960. Known as the "nouveau franc," it is designated NF, its value being 100 times the former franc. Currency now in use will be circulated for some years. The nouveau franc is divisible into 100 centimes, one centime equaling one of the old francs.



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SPAIN

EXPLORATION: The predicted rush to obtain exploration rights with the passage of the new oil law proved to be correct. About 22 companies applied, and received exploration rights in Spain, the Spanish Sahara, and Spanish Guinea. Following settlement of overlaps, the companies were awarded areas shown on the accompanying map.

For a brief history of exploraiton, see *WPR 1957, and WPR 1959,* P. 97. The most active company is Valdebro, owned by General American Oil Co., a Texas independent, with other associates (*see WPR 1957*). Caltex and Bear, Stearns Co. have dropped out and their interest absorbed by General American. In *WPR 1959,* p. 97, is given a list of Valdebro wells drilled through 1958. Below is a list of wells drilled in 1959 to August 20.

Cerro Gordo No. 1 (Cadiz) (Valdebro No. 14): Completed February 11, 1959, at a total depth of 11,675 ft (3,558.5 meters) in the Triassic Muschelkalk (?). Small amounts of gas were recovered in several drill-stem tests.

Pamplona No. 1 (Navarra) (Valdebro No. 18): Completed February 11, 1959, at a total depth of 9,148 ft (2,788.3 meters) in the Triassic Keuper. Several shows of oil and gas were noted, and the well flowed at the rate of 500 mcf of gas per day on a drill-stem test at 5,299 ft to 5,345 ft.

Retuerta (Burgos and Santander) (Valdebro No. 20): This well was drilling at 9,913 ft on August 20, 1959. Numerous oil shows have been reported in cores, but no porous reservoir section has as yet been encountered.

Pamplona No. 2 (Navarra) (Valdebro No. 21): The location of this well is 600 meters east-northeast of the town of Orcoyen, 5 kilometers west-northwest of the center of the city of Pamplona, and 3.8 km southeast of Pamplona No. 1. The well was abandoned May 9, 1959, at a total depth of 6,890 ft (2,100 meters).

Cerro Gordo No. 2 (Cadiz) (Valdebro No. 22): The location of this well is 3 km north, 62° west, of well No. 1. It is near the eastern edge of the province of Cadiz. It was completed August 5, 1959, at a total depth of 11,080 ft (3,413 meters). No shows of oil or gas were encountered.

Monesma No. 1 (Huesca) (Valdebro No. 23): Location of this well is in northeastern Spain about 28 km west-northwest of the city of Tremp in the northeastern part of of the province of Huesca; it was drilling at 7,250 ft on August 20, 1959.

PRODUCTION: There is no crude-oil production as yet. A shale-oil complex, built by the government and known as the Empresa Nacional Calvo Sotelo, reported that a total of 192,236 tons of bituminous shale had been treated in Spain in the first quarter of 1959. Production from shale was 15,898 tons, of which gasoline output was 1,028 tons and ammonium-sulfate output 1,291 tons.

REFINING: There are three refineries in the country, as listed in *WPR 1959,* p. 96. INI, the government's company, plans a 25,000 b/d plant at Puertoallano, and a Caltex affiliate is planning to boost capacity of its 80,000 b/d Cartagena refinery to 110,000 b/d in 1960. The refinery is owned by Refineria de Petroleos Escombreros SA (24% Caltex, 52% the government's Instituto Nacional de Industria, and 24% Cia, Espanola de Petroleos de Petroles SA).

OIL LAWS

The new Spanish oil law was passed in December 1958. For a summary of its contents, see *WPR 1959,* p. 98 and 99. The regulations to the law were issued in June 1959, beginning the oil rush. Both the law and its regulations have been translated and appear in *"Europe—Basic Oil Laws and Concession Contracts,"* published by *Petroleum Legislation Ltd., P.O. Box 1591, Grand Central Station, New York 17, N. Y.*

The terms of the new oil law appear favorable. They include: no limitation on the amount of international participation (although permits are granted "keeping in mind the amount of Spanish participation"); low rentals—about 3.5 US cents per hectare; rentals are made deductible from royalty during exploitation; and depletion allowance of 25% of gross up to 40% of net. There are some disadvantages, too; for example, a discovery must be made to obtain an exploitation concession, but the law is workable as it stands.

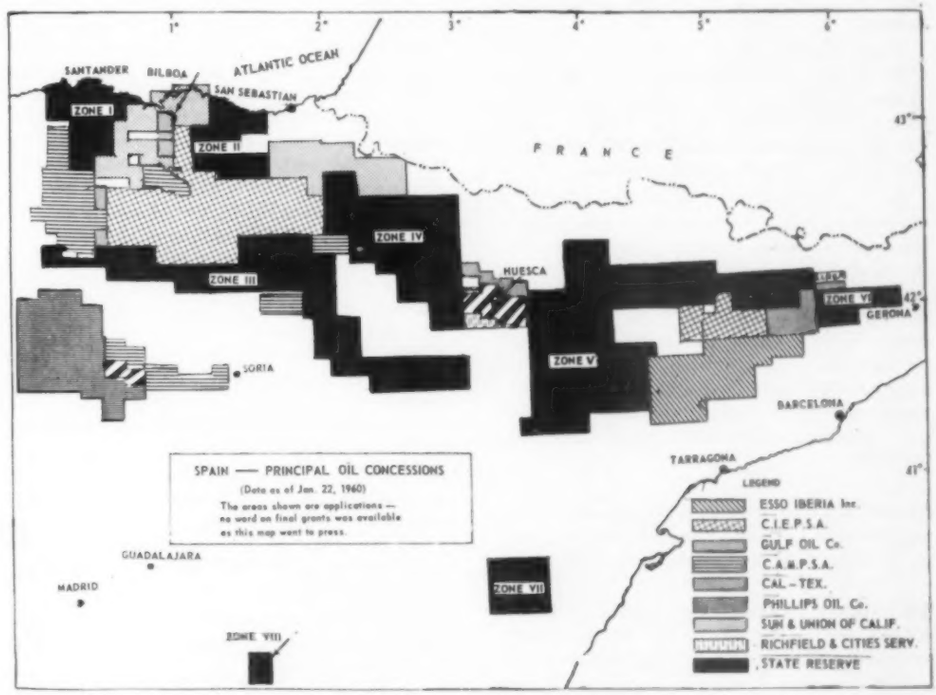
SPAIN—Imports and Exports, 1958
(Thousands of Barrels)

Crude Petroleum	
IMPORTS:	
Iran	6,473
Iraq	8,460
Saudi Arabia	14,984
Total	29,917
Refined Products	
IMPORTS:	
Gasoline	604
Kerosine	73
Gas oil	1,121
Fuel oil	1,026
Lubricating oil	533
Asphalt	59
Paraffin & petrolatum	29
Total	2,445
EXPORTS:	
Gasoline	577

Source: "Estadistica del Commercio Exterior Espagna," Madrid, 1958, through US State Dept.

NATIONAL FACTORS

Recently Span has undertaken a fiscal reform aided by the USA government. A policy of rapid industrialization is continuing, but accompanied by serious inflationary and balance-of-payments difficulties. The industrialization has rapidly accelerated Spanish demand for oil (as covered in *WPR 1959,* p. 98), especially fuel oils.



UNITED KINGDOM

EXPLORATION: The search for oil began in 1934, as covered in *World Petroleum Report 1957* (p. 257), and has continued with some slight success, but large production has not been established. Cumulative production to September 30, 1959, was 1,202,000 long tons. The crude has a valuable content of lubricating oil and high-melting-point waxes.

During 1959 BP Exploration Co. Ltd. continued to search for oil and also, on behalf of the Gas Council of Great Britain, for natural gas.

Exploration has concentrated on the Carboniferous structures in the areas around the existing fields in the east Midlands in the Mesozoics of southern England. The main targets in the Carboniferous rocks of the east Midlands are sandstones in the Lower Coal Measures and Millstone Grit Series, with the secondary consideration the limestone of the Lower Carboniferous.

Further drilling was undertaken in the oil fields at Plungar and Egmanton, and a new pool was found at each. Development drilling commenced in the new fields at Bothamsall, Corringham, and Gainsborough. In the Bothamsall field, nine wells have now been completed,

UNITED KINGDOM—Crude-Oil Production, 1959
(Long Tons)

January	6,604	July	6,577
February	6,313	August	6,496
March	6,879	September	6,976
April	6,867		
May	6,799	Total	59,876
June	6,365		

UNITED KINGDOM—Monthly Average Refinery

	1959*	1958
	(Thousands of Long Tons)	
Throughput:		
Crude and shale oils	3,221.6	2,744.4
Output:		
Aviation and motor spirit	615.5	562.6
Industrial and white spirit	11.8	12.0
Kerosine—		
Burning oil	125.2	90.3
Vaporizing oil	12.0	17.4
Lubricating oil	73.2	62.6
Gas-diesel oils	605.4	523.7
Fuel oil	1,291.8	1,047.7
Refinery fuel	248.8	208.6
Bitumen	79.3	71.6
Total, all products	2,972.5	2,535.8

*January to August. **Source:** Central Statistical Office Monthly Digest of Statistics.

eight of which have proved oil from the sandstones above the Millstone Grit, and several more were to be completed before the-year-end. At Corringham and Gainsborough, one further well at each field has proved oil in sandstones in the Coal Measures and at other horizons down to the Kinderscout Grit about 700 ft below the top of the Millstone Grit. In addition, a dry hole has been drilled at Corringham, and one which has so far proved only gas at Gainsborough.

Three exploration wells were completed in 1959 in the Carboniferous area at Bingham, Walkeringham, and High Marnham. Bingham gave indications of oil, but of insufficient quantity for commercial production. Walkeringham had several non-commercial gas shows.

In the Mesozoic area of southern England, exploration has continued with five wells at Radipole, Langton Herring (two wells), Bere Regis, and Kimmeridge. At Kimmeridge, oil was produced from the Cornbrash in the Middle Jurassic at a depth of 1,760 ft. Prolonged testing is now being undertaken. Meanwhile further wells are being drilled to investigate the accumulation, and a seismic survey is being made offshore to further elucidate the structure. The other south-of-England bore holes were dry.

PRODUCTION: During 1959, production averaged about 1,670 b/d to end-September, compared with 1,590 b/d in the year 1958.

TRANSPORTATION: For handling 100,000-tonners, British Petroleum Co. has completed its enlarged Finnart (Loch Long) terminal, and by mid-1960 Esso Petroleum Co.'s new terminal at Milford Haven will be completed. A little later, British Petroleum's new terminal at Angle Point (also in Milford Haven) will be ready; the 60-mile 18-in. pipeline linking it to Llandarcy is well advanced, with completion expected in July.

Early May 1960 should see Mersey docks and harbor board's new floating stages at Tranmere ready for receiving 65,000-ton tankers, and the 6-mile 24-in. pipeline completed to Shell's Eastham reception point for crude delivery to Stanlow refinery.

A project for an additional deep-water tanker berth is under way for the Port of Bristol Authority. Other transportation projects planned include converting Holyhead into a major oil port and building a terminal at Howden on the Tees.

Six 23-mile lines are being laid from Shell's Stanlow refinery: two of these, about 50% completed at end-1959, are 6-in. and 8-in. lines to supply Shell-Mex and BP's new installation at Partington.

A start was made late in 1959 by Shell-Mex and BP on an 8-mile 6-in. line to supply new depots in and around London Airport with jet fuels from its Walton-on-Thames depot.

Esso Petroleum is seeking planning permission to lay a 75-mile 43,000 b/d oil products pipeline from its Fawley refinery to a new 600,000-bbl distribution depot near London Airport.

REFINING: Refining capacity, officially put at 767,980 b/cd (38,389,000 long tons) at the end of 1958, had risen to 897,020 b/cd (44,851,000 tons) by the end of 1959. Over the first eight months of 1959, total throughput was 25.8 million tons against 21.2 million in the same period of 1958.

Both Shell Refining and British Petroleum brought large crude distillation units onstream early in 1959, raising capacity at Shell Haven and Grangemouth appreciably; capacity of the Shell Haven unit was 80,000 b/d.

A Platformer, now operating at 19,000 b/d, was completed about mid-year at Esso Petroleum's Fawley refinery; this is equipped for on-stream catalyst regeneration, and is integrated with a Hydrofiner and a new naphtha stabilizer. Esso's new 4½ million-ton-per-year refinery building at Milford Haven went into winter up to schedule, with processing due to start next September.

Imperial Chemical Industries has brought on a third cracker, a 44,000-ton-per-year ethylene plant, raising total works capacity to 110,000 tons and olefin capacity to 230,000 tons. Expansion of the three plants to 140,000 tons a year is being planned.

The 20 million-pound-per-year Wilton plant to make the polypropylene plastic "Propathene" under a license covering Montecatini and Montecatini-Ziegler UK patents is now expected to be in operation well before the original end-1960 set. A plan to raise the quality of the 95% pure propylene from the olefin plants is building to provide feed stock for the Propathene plant. Plans are in hand for large-scale manufacture of propylene oxide and propylene glycol, and are at an advanced stage for extending the ethylene-oxide plant, where a direct oxidation method may be used instead of the chlorhydrin route.

At the Billingham Oil Works of the ICI Heavy Organic Chemicals Division, a third carbonylation unit was started up in July 1959; this is now operating at a 60,000-ton-per-year rate. Billingham synthetic phenol output is being raised to 20,000 tons a year from 15,000 tons, and the first of ICI's new higher alcohols to be produced on a commercial scale—isodecanol—has been added to the sales range.

British Hydrocarbon Chemicals Ltd. (British Petroleum and Distillers) commisisoned in 1959 a plant for making "Rigidex" polyethylene by the Phillips low-pressure process, for which the exclusive UK license is held by Distillers. BHC also had plants to make phenol and acetone due to come into operation at Grangemouth by the end of 1959, and is constructing a third cracker, with completion due mid-1960. With a 70,000-ton-per-year capacity.

UNITED KINGDOM—Monthly Average Deliveries into Consumption of Motor Spirit and Gas-Diesel and Fuel Oils

	1959*	1958
	(Thousands of Long Tons)	
MOTOR SPIRIT		
Dealers—		
Premium grade	339.5*	291.1
Regular grade	133.3*	132.2
Commercial users—		
Premium grade	33.1*	30.0
Regular grade	91.8*	98.6
GAS-DIESEL AND FUEL OIL		
For burning—		
Public electricity generation	326.7†	215.1
Steel manufacture	160.1†	145.5
Other Industrial	390.1†	339.8
Central heating	180.0†	158.8
Total burning	1,061.8†	865.2
For power—		
Agriculture	44.8†	38.1
Marine craft	80.9†	78.0
Total power	202.8†	189.3
For gas making	40.8*	55.4
Total, all products	2,679.5*	2,377.8

*January to October. †Includes minor products not shown, such as waxes, gases, miscellaneous.
Source: Central Statistical Office Monthly Digest of Statistics.

Important 1959 completions in the field of fertilizer production from petroleum were Shell Chemical Co.'s 75,000-ton-per-year ammonia plant at Shell Haven and, dependent on its ammonia and nitric acid, the Stanford-le-Hope 140,000-ton-per-year ammonium-nitrate plant of Fisons Ltd.

Shell Chemical Co. is building large-scale polyolefin production facilities at Carrington, the first stage begin an output of 30,000 tons a year of polyethylenes and polypropylenes, including high-density polyethylenes made under Ziegler license.

Monsanto Chemical Co.'s 10,000-ton-per-year polyethylene plant at Fawley, which started production early in 1959, is already being expanded. Union Carbide is augmenting its polyethylene production facilities at Grangemouth, and is building a £1¾ million 30 million-pound-per-year unit which should begin operating late in 1960 and double plant capacity. At its Hythe (Southampton) works, Union Carbide expected its 45 million-pound-per-year plant for ethylene oxide and derivatives to be operating by end-1959.

International Synthetic Rubber Co. is now building a 2½ million-gallon-per-year plant to make synthetic latex: there are reports that the rubber plant is being expanded to 90,000 tons per year from 70,000 tons. The neoprene synthetic rubber plant in Northern Ireland of Du-Pont Co. (United Kingdom) Ltd. can be revealed as due for completion towards the middle of 1960, but the capacity figure is still not available.

OIL LAWS

Controlling Statutes: Exploration and production in the United Kingdom are governed by the Petroleum (Production) Act, 1934; the Petroleum (Production) Regulations, 1935; the Petroleum (Production) Amendment Regula-

UNITED KINGDOM—Refining Capacity
B/CD at Mid-1959)

NAME OF COMPANY	PLANT LOCATION	CRUDE CAPACITY	TYPE	CRACKING
BP Refinery (Kent) Ltd.	Isle of Grain, Kent[1]	180,000	SCL	12,500 C
BP Refinery (Grangemouth) Ltd.	Grangemouth, Scotland	68,000	SC	12,500 C
BP Refinery (Llandarcy) Ltd.	Llandarcy, S. Wales	62,000	Comp.	12,500 C
Berry Wiggins & Co. Ltd.	Kingsnorth, Kent	3,200	SA	—
Berry Wiggins & Co. Ltd.	Weaste, Near Manchester	2,200	SA	—
Briggs & Co. Ltd., Wm.	Dundee, Scotland	820	SLA	—
Esso Petroleum Co. Ltd.	Fawley, Hampshire[2]	228,100	Comp.	52,100 CS
Lobitos Oilfields Ltd.	Ellesmere Port, Cheshire[3]	3,700	Comp.	800 T
Manchester Oil Refining Ltd.	Trafford Park, Manchester	3,500	Comp.	—
Mobil Oil Co. Ltd.	Coryton, Essex[4]	37,800	Comp.	9,500 C
Scottish Oils Ltd.	Pumpherston, Scotland	3,500	SC	2,800 T
Shell Refining Co. Ltd.[5]	Shell Haven, Essex[6]	160,000	D/Ref/L/A/Wax	—
Shell Refining Co. Ltd.[5]	Stanlow, Cheshire[7]	105,000	D/C/Ref/L/A	35,000 C
Shell Refining Co. Ltd.	Heysham, Lancs[8]	36,000	D/Ref/Visb.	6,000 Visb.
Starhaven Refineries Ltd.	Ardrossan, Scotland	3,200	D/A	—

[1] 6,000 b/d Platforming, 10,000 b/d catalytic reformer, 12,000 b/d thermal reformer, two 10,000 b/d Hydrofiners, 2,250 b/d alkylation unit, 45-ton-per-day sulfur-recovery unit. [2] 13,500 b/d Hydroforming, 19,000 b/d Powerforming, 27,000 b/d Hydrofining, 46,500 b/d catalytic cracking, 5,600 b/d steam cracking, 4,200 b/d butene dehydrogenation, 54,000 b/d naphtha stabilizing. [3] 800 b/d Platforming. [4] 6,000 b/d catalytic reforming. [5] Partly owned by Starhaven Refineries Ltd. [6] 13,000 b/d thermal reforming, 6,700 b/d catalytic reforming. [7] 13,000 b/d thermal reforming, 10,000 b/d catalytic reforming. [8] 4,000 b/d thermal reforming. S—Skimming: D—Distilling: C—Cracking: Ref.—Reforming: L—Lubricating oil: Comp.—Complete: A—Asphalt. Under Cracking: C—Catalytic: T—Thermal: S—Steam: Visb.—Visbreaking.

tions, 1954; and the Petroleum (Production) (Amendment) Regulations, 1957. The Mines (Working Facilities and Support) Act, 1923, and the Gas Act, 1948, also apply. The Oil in Navigable Waters (Exceptions and Exemptions) Regulations, 1958, was published as S.I. 1958 No. 1060. It came into operation on July 26, and re-enacts with amendments the Oil in Navigable Waters (Exceptions and Exemptions) Regulations, 1956.

Ownership of unextracted petroleum is vested in the crown. The regulatory agency is the Ministry of Power, to which all applications for oil rights must be made. The legislation does not extend to Northern Ireland. The position there is regulated by the United Kingdom Petroleum (Products) Act, 1918; the Petroleum (Consolidation) Act (Northern Ireland), 1929; and the Petroleum (Transfer of Licenses) Act (Northern Ireland), 1937.

PORTUGAL

EXPLORATION: For a review of the history and previous exploration in Portugal, see *WPR 1957*, p. 222, and *WPR 1959*, p. 96. During 1959 Mobil Exploration Portugal Inc. continued drilling, but without success (see accompanying table of wells drilled).

For a concession map of Portugal, see *WPR 1959*, p. 96.

PRODUCTION, MARKETING, REFINING: There is no production in the country, and only one refinery, a 22,900 b/d plant owned by SACOR. See *WPR 1959*, p. 96, for details. For marketing estimates, see also *WPR 1959*, p. 96.

OIL LAWS

Since the oil possibilities of Portugal appear bleak, the principal laws of interest are those governing development in the Portuguese territories, whch have an area 22 times larger than Portugal itself. They are cited in *WPR 1959*, p. 96. Copies of all the laws listed there have been published in English translation in *"Europe—Basic Oil Laws and Concession Contracts."* It is available from *Petroleum Legislation, Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

No change in taxation or the principal factors affecting oil has occurred since listings of *WPR 1959*, p. 96; and for basic factors, see *WPR 1957*, p. 222.

PORTUGAL—Imports, 1958
(Thousands of Barrels)

	Crude Oil	Gasoline Motor	Gasoline Other	Kerosine	Gas and Diesel Oils	Fuel Oils	Lube Oil	Other	Total
Curacao	—	99	11	174	569	372	15	—	1,240
United States	—	2	1	48	7	—	94	2	154
Venezuela	113	6	—	37	96	163	—	—	415
Belgium—Lux.	—	—	—	—	—	25	3	—	28
France	—	—	3	44	38	—	—	—	45
Italy	—	—	—	3	—	65	—	—	68
Netherlands	—	—	—	—	—	13	16	—	29
United Kingdom	—	—	—	—	—	46	41	—	87
USSR	243	—	—	—	—	—	—	—	243
Aden	—	—	—	23	110	145	—	—	278
Iran	842	—	—	71	165	102	—	—	1,180
Iraq	7,213	—	—	—	4	—	—	—	7,217
Saudi Arabia	105	—	—	—	64	—	—	—	169
Canary Islands	—	4	—	5	5	—	—	—	14
Other	—	—	—	33	14	—	2	2	51
Total	8,516	111	15	398	1,072	931	171	4	11,218

Source: U. S. State Dept., Lisbon.

PORTUGAL—Exploratory Wells Drilled
(July 1, 1958, to July 1, 1959)
(By Mobil Exploration Portugal Inc.)

Name	Total Depth (Feet)	Status	Location
Vermoil	7,575	Dry & abandoned	80 mi N of Lisbon
Verride-2	2,275	Dry & abandoned	100 mi NNE of Lisbon
Samora-1	4,209	Dry & abandoned	22 mi NE of Lisbon
Lourinha	5,095	Dry & abandoned	35 mi NNW of Lisbon
Abadia-101	1,476	Dry & abandoned	25 mi NE of Lisbon (Torres Vedras area)
Samora-1-A	5,938	Junked & abandoned	22 mi NE of Lisbon
North Matacaes	4,478	Dry & abandoned	25 mi NE of Lisbon (Torres Vedras area)
Montijo	7,506	Dry & abandoned	12 mi E of Lisbon
Runa	1,555	Dry & abandoned	25 mi NE of Lisbon (Torres Vedras area)
Praganca	1,640	Dry & abandoned	30 mi NEE of Lisbon; 10 mi NE Torres Vedras area

SWEDEN

EXPLORATION AND PRODUCTION: There is no exploration for nor production of oil in Sweden.

REFINING: There are five refineries in the country. No changes have occurred in their capacities as given in *WPR 1959*, p. 100. One change of ownership occurred when Swedish Shell Oil Co. purchased a half interest in the 40,000 b/d Koppartrans plant at Goteborg.

MARKETING: Imports of oil are shown in the accompanying table. For about 20 years oil consumption has risen more rapidly in Sweden than in other European countries. A study recently has been published (I. J. Gillberg—E. Hook, in *Svensk Ekonomi*, Stockholm, 1959). The study estimates that oil now covers about half the country's energy demand compared with barely 1/10th in the mid-1930's. Industry is the largest user of petroleum products, accounting in 1955 for about 37% (including bunkers).

According to the study, between 1935 and 1955 energy consumption in Swedish industry went up to 12.7 million tons hard-coal equivalent from 7 million, while the number of employed workers grew over the same period by over 60% and the volume of industrial production by over 120%. These figures indicate a rising output both per worker and per unit of energy, reflecting the great technical progress made.

For a review of Swedish consumption from 1948 through 1957, see *WPR 1959*, p. 100.

A trade agreement between Sweden and the Soviet Union for the calendar year 1959 puts the Soviet oil quota at 1.6 million tons (32,000 b/d). For 1960 and 1961, oil quotas are 1.8 million tons and two million tons, respectively.

OIL LAWS

There is no separate law for petroleum, which falls under the Mining Act of June 3, 1938, and the Act of May 28, 1886. A copy of this law is available through *Petroleum Legislation, Inc., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

SWEDEN—Imports, 1958
(Thousands of Barrels)

Crude petroleum	16,197
Gasoline	10,535
Kerosine	2,416
Gas and fuel oils	49,955
Lubricants	656
Solvents	393
Paraffin	47
Other	14
Total	80,213

Source: U. S. State Dept., Stockholm.

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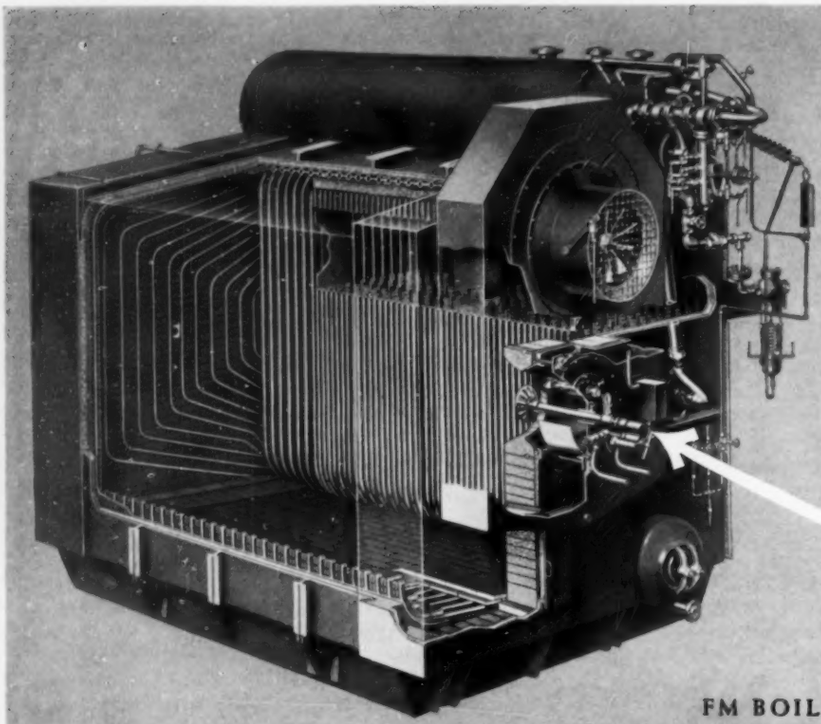

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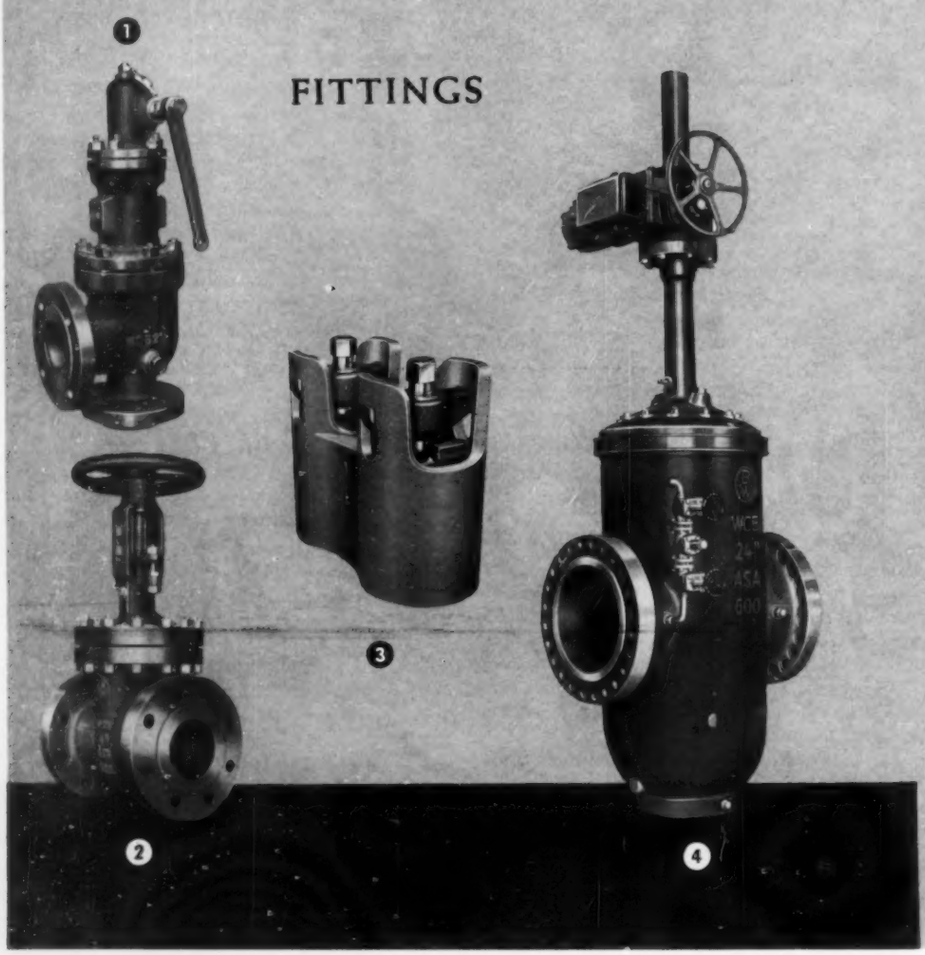

1 Consolidated safety valves of standard design as well as for counter pressures with siphon and relieving piston

2 Refinery slide valve serial number 150-1500 NW 2"-24" of unalloyed and alloyed electric cast steel

3 Reverse bends of various design of unalloyed and alloyed electric cast steel

4 Pipeline slide valves for all operating pressures

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GERMANY

The German oil industry has been characterized by intensive development in the refining and petrochemical sectors—with less success in development of production and exploration. However, as it is based throughout on an extremely high level of technical efficiency, Germany's oil industry ranks among the most highly developed in the world, along with Russian and American techniques.

As the Sixth World Petroleum Congress will be held in Germany during 1963, the German oil industry assumes particular interest. This, therefore, is the first of a series of yearly reviews, each fulfilling a different gap in the story of the evolution of Germany's oil. It is impossible to tell the entire story in one issue; so the present review, although it covers 1959 developments, is concentrated on the background of the industry.

EXPLORATION—Exploration in 1959: Intensive exploration by oil companies holding concession areas in West Germany was continued in 1959 at about the same level as in the previous year. Several wildcats and extension wells were successful, and some newly discovered oil and gas deposits can be listed in the Emsland and Weser-Ems districts as well as in the upper Rhine valley. None of the oil finds seem, however, to be of major economic importance.

In 1958, the total footage drilled in West Germany amounted to 2.5 million. Footage drilled in 1959 is estimated at slightly below this level. Up to November, a total of 2.28 million feet had been drilled, using about 125 rotary rigs and 150 shallow-depth rigs. Exploration wells (wildcats and extension wells) were 41.5% of total footage.

While a find made in December 1959 near Meppen (Emsland) may be considered more or less as an extension of the older Hebelermeer field, in northwestern Germany only one new oil field was discovered in 1959, viz., Loeningen in the Weser-Ems district. The Loeningen 2 exploratory well by Mobil Oil AG on behalf of the Oldenburg consortium (Gewerkschaft Brigitta-Mobil Oil) one mile west of Loeningen, went to a total depth of 4,068 ft and struck oil in the basic sands of the Kimmeridge (Upper Jurassic) between 3,767 ft and 3,806 ft. Initial production tests revealed that a flowing production of 15 to 20 cubic meters daily may be expected. The oil is light, and has a specific gravity of 0.853.

Some successful extensions raised the reserves of the northern part of Germany much more than the find at Loeningen. In the province of Schleswig-Holstein, the productive area of the Ploen-Ost oil field of Deutsche Erdoel AG was considerably extended by Ploen-Ost 15 well—drilled about one mile north of the hitherto producing district; it struck oil beyond a tectonic fault in the main sandstone of the Dogger beta which had limited the field thus far. On the basis of the drilling results obtained, it may be expected that the oil reservoir located at the eastern border of the Holstein Jurassic basin extends farther towards the Kiel oil field about 15 miles away. Normal production rate on the Ploen-Ost 15 well is about 170 b/d.

In Hanover province, a prolific extension was achieved by Lueben-West 1, drilled by Itag on behalf of the consortium of Gewerkschaft Elwerath-Itag-Mobil Oil-Preussag, about two miles west of the producing area of the Lueben field. The Lueben-West structure is separate from that of Lueben, and is divided into blocks. Both oil reservoir rocks of the Dogger beta, which are productive in the Lueben field as well, have proved to be oil-impregnated. The lower horizon has gone to water, however—in its deeper sections the edge-water limit being 500 ft deeper than in the Lueben field. Therefore, only the upper 8 ft of this horizon, between 4,748 ft and 4,756 ft, have been opened up. Production tests yielded an initial flow of 150 b/d of water-free light oil (specific gravity, 0.843) through a 1/10-in. choke.

In the Weser-Ems district, the Dickel oil field of Wintershall GA, located near Diepholz, has been extended in an easterly direction by two successful wells. The Dickel field is situated on the northern flank of the Rehden structure. The wells which thus far had been successful in the western section of the northern flank have encountered oil both in the Wealden and in the Malm. The extension wells Dickel-Ost 1 in the Wealden, and Dickel-Ost 3 in the Kimmeridge, located east of the hitherto proved field, were completed as producers. Dickel-Ost 1 yielded a free initial flow of 20 cubic meters of crude daily from a depth of 3,839 ft to 4,036 ft. Dickel-Ost 3 is producing a similar quantity by pumping from a depth of 3,182 ft to 3,199 ft. The holes are two miles apart on different structures.

Farther to the west, the exploratory well Osterbrock 1, brought in by Deutsche Schachtbau- und Tiefbohrgesellschaft mbH on behalf of the Gewerkschaft Elwerath-Schachtbau consortium, struck oil in the Bentheim sandstone at a depth of 3,051 ft to 3,156 ft. The well, situated about 1,600 ft northeast of Osterbrock (between Lingen and Meppen) had been drilled to establish the western extension of the Wettrup-Bramhar field discovered a year earlier. It has thus been proved that the western boundary of this oil deposit extends into the Dalum concession of the Elwerath-Schachtbau consortium. The free flow of oil from the well, which started subsequent to shooting, was in the range of two cubic meters per hour through a 1/16-in. choke. From existing seismic data and the present knowledge of the extent of the sand facies, there is every likelihood that a number of productive wells may be found between the clay zone and the edge-water border in the Dalum concession.

Some new discoveries were added in 1959 to the small oil fields in the upper Rhine valley, most of which are more or less uneconomic. The C. Deilmann-Wintershall consortium found oil in two wildcats north of Karlsruhe town. The exploratory well Knielingen 3 drilled in the area of the Deilman concession of Karlsruhe-Linkenheim on behalf of the consortium has encountered the variegated Niederroedern beds impregnated with oil between 4,790 ft and 4,813 ft. The well is situated about one mile north of Knielingen town, about a half mile west of the Knielingen 1 well, in which promising oil shows had been discovered earlier. The wildcat Graben 1, belonging to the same consortium, struck oil in the Philippsburg-Linkenheim concession of Wintershall. A casing test from the variegated Niederroedern beds yielded a flow of oil from a horizon between 4,820 ft and 4,826 ft, while oil and water flowed from another horizon immediately above the former between 4,770 ft and 4,780 ft. In November 1959, Knielingen and Graben together delivered 2,500 bbl of crude only.

A third find in the upper Rhine valley was made by the exploratory well Rheinzabern 1 of the DEA-Elwerath-Itag-Winterschall consortium, drilled about nine miles northwest of Karlsruhe (on the left bank of the Rhine). This well encountered several oil-impregnated layers of the variegated Niederroedern beds and of the Cyrena marl at a depth of 3,708 ft to 3,822 ft. A production test yielded a daily flow of approximately three cubic meters of crude which, however, contained up to 10% of water. The recovered oil had a pour point of 25 C to 30 C, the specific gravity being approximately 0.820.

The gas reserves of West Germany were increased in 1959 by some new finds in the Weser-Ems and Emsland provinces. In April 1959, gas was struck by the wildcat Buchhorst Z-1 drilled by Mobil Oil AG on behalf of the Elwerath-Mobil Oil consortium in the main dolomite of the Zechstein between 9,951 ft and 10,056 ft. A production test yielded natural gas in commercial quantities. The pressure at the well head amounted to 335 atm. gauge. The well Buchhorst Z-1 is situated about two miles east of the Wehrbleck oil field in the area between the gas field of Redehn near Diepholz and the village of Sulingen (Weser-Ems).

At the same time the wildcat Esche Z-1, drilled by Wintershall AG for the Emsland consortium consisting of the four firms Gewerkschaft Elwearth-Deilmann-Preussag-Wintershall, was successful in finding gas in the main dolomite of the Zechstein between 9,407 ft and 9,594 ft. The well-head pressure is approximately 275 atm. gauge. The well Esche Z-1 was located about two miles north of Neuenhaus (Emsland), on a separate structural high approximately 4.5 miles south of the well Kalle 1, which had also encountered gas.

A further gas find was made by the Wildcat Dalum Z-2 of the Schachtbau-Elwerath consortium in the main dolomite of the Zechstein. The porous gas horizon was encountered at a depth between 9,594 ft and 9,722 ft. Surveys and analyses so far carried out revealed that, both

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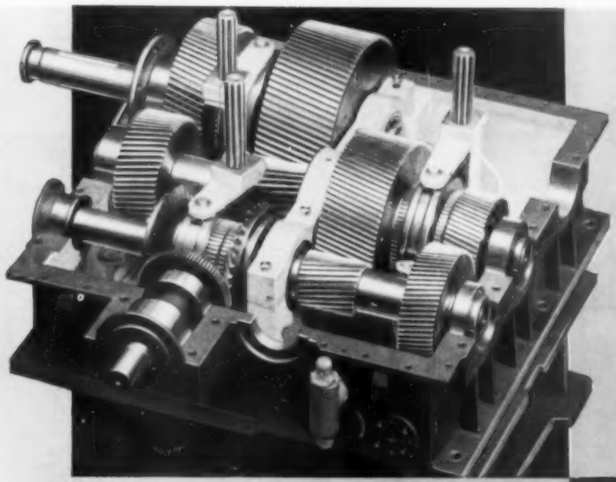

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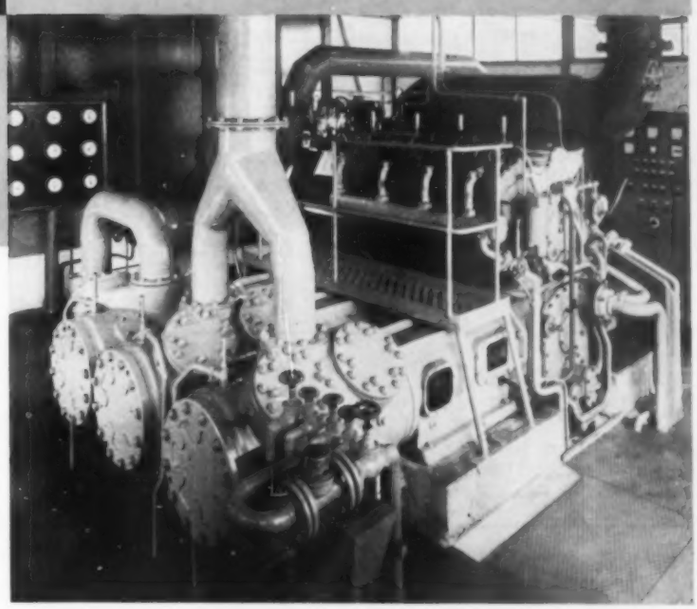

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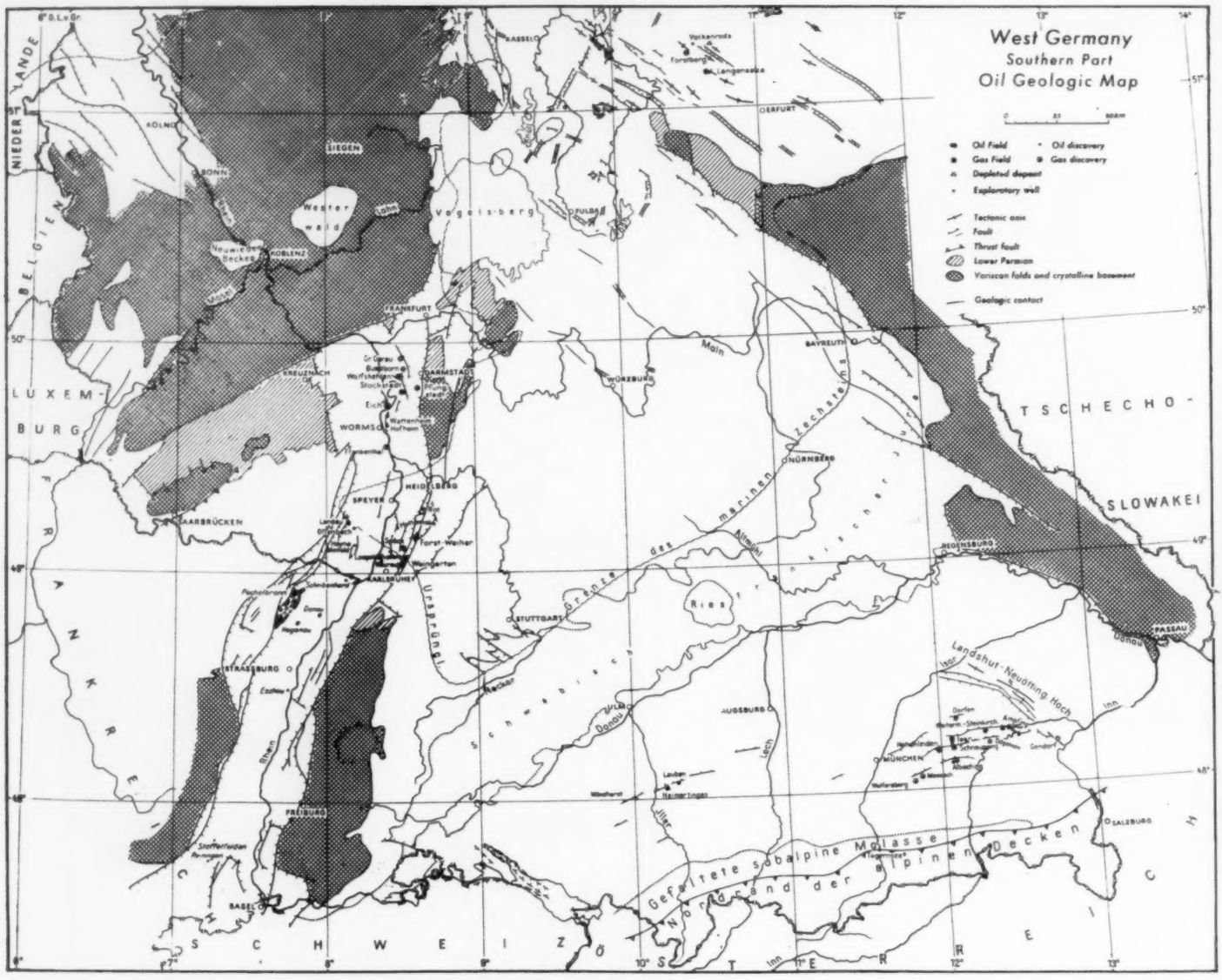

regarding its productivity and gas quality, the well is equivalent to the Adorf wells. At constant closed-in pressure, the flow of gas per hour was 1,200 standard cubic meters through a ⅛-in. choke and 3,000 standard cubic meters through a ⅕-in. choke.

Early in November the Wielen Z-2 exploratory well of the Emsland consortium struck gas in the main dolomite of the Zechstein at a depth of about 6,726 ft. The closed-in pressure at the well head amounted to 205 atm. gauge. The well is situated about nine miles south of Emlichheim and five miles west-northwest of the Itterbeck gas field. So far, 500,000 cubic meters of gas have been burned during production tests.

In December 1959, natural gas was discovered for the first time in the Buntsandstone formation of the Emsland. Up to now gas deposits have been found in the Zechstein only. The strike was made by the Adorf Z-7 well which had been sunk in the northern part of the Adorf gas field by Preussag on behalf of the Deilmann-Elwerath-Preussag-Wintershall consortium. The gas was encountered in the structural sandstone zone of the Buntsandstone from 7,038 ft to 7,139 ft. The gas has a methane content of about 70% and is free from hydrogen sulfide and carbon dioxide. Production tests yielded a daily production of 63,000 standard cubic meters through a 1/6-in. choke.

Geology of Oil and Gas in Germany: An excellent review of the geology of Germany's hydrocarbons has been written by Dr. F. Kühne, of the Federal Institute for Exploration of Natural Resources, published in *World Petroleum,* June 1959 issue, Sect. II (Germany), p. 19. The following discussion is in large part taken from that review by Dr. Kühne.

There are three major regions of oil and gas origin in Germany. They are northwestern Germany, the Rhine valley graben, and the Molasse trough. In northwestern Germany, a deep basin was filled with thick sediments of Cretaceous, Jurassic, and Triassicage. They differ considerably, and have attained their greatest thickness in the southern and eastern parts of the basin, as well as north of the Elbe River in western and eastern Schleswig-Holstein. In this region, the folding and faulting of the Saxonian tectonics have produced: (a) types of anticlinal structures of the Emsland, west of the Ems River; (b) in the area between the Ems and Weser Rivers, very complex structures partly associated with overthrusts. Here, salt migration plays a subordinate role. Salt domes or diapirs have not been formed in areas where anticlines exist. There, uncomformity traps, as well as those due to facies changes, occur.

East of the Weser, along the Aller River and between the Harz Mountains in the northwest and the Elbe River, salt domes are encountered in areas with thick Jurassic and Lower Cretaceous sediments. The oldest oil fields of Germany—Wietze, Nienhagen, Oedesse-Oelheim, and Oberg—have been found on the flanks of the salt domes. Since 1949, also other types of oil accumulations have been found. These include the anticlinal fields of Suderbruch and Eldingen which lie in regions formerly considered as areas of depression between salt domes.

The Rhine Valley is a graben bordered by faults along its western and eastern margins. The graben extends from Basel to Mainz. It has a length of 300 km, and is 40 km wide. Only the area between Karlsruhe and Mainz on both sides

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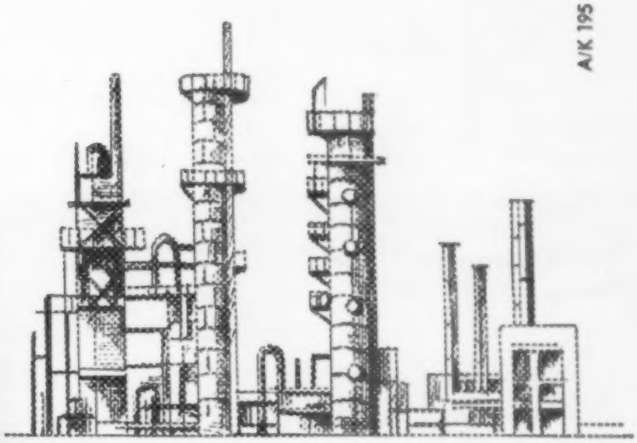

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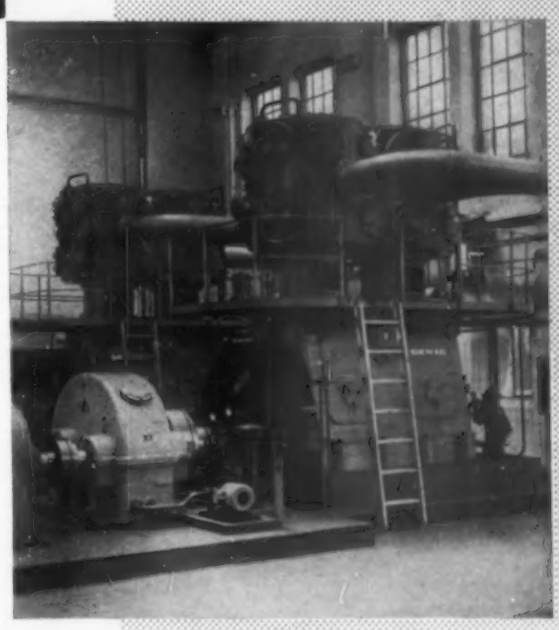

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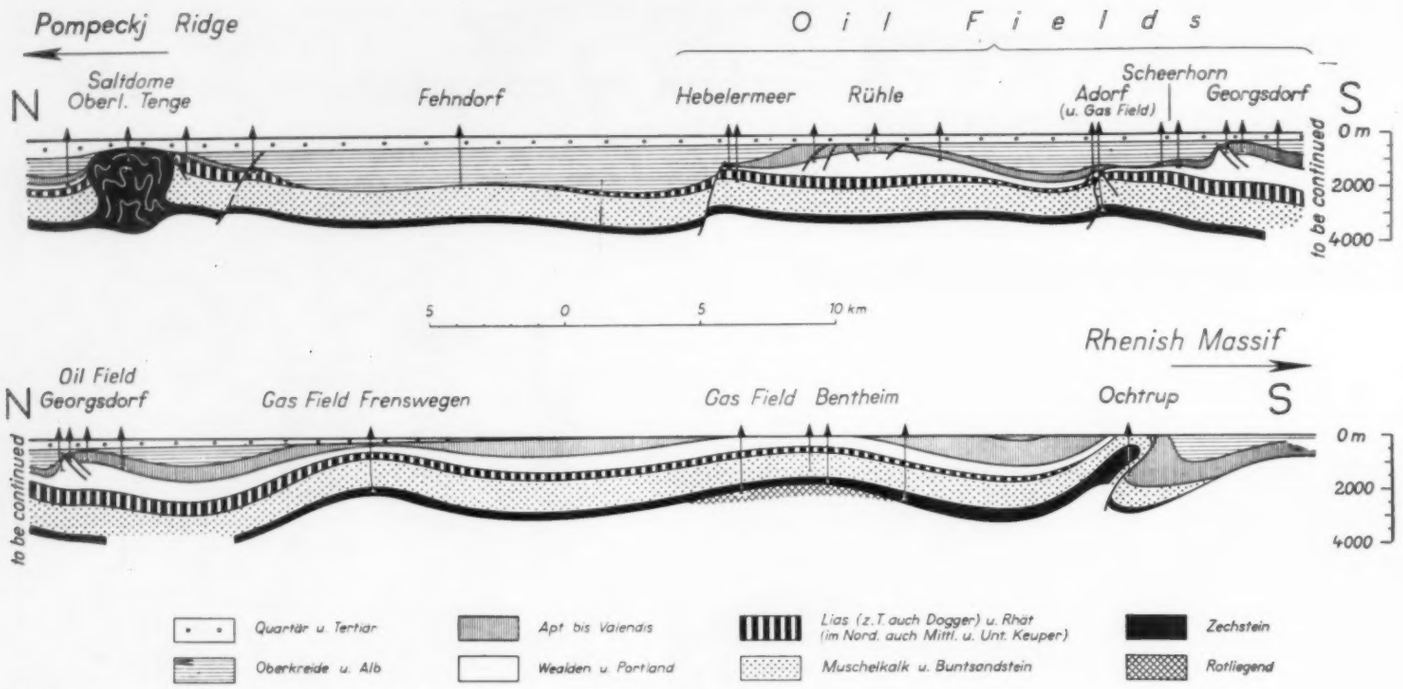

N-S section through the Oil and Gas Fields of the Emsland area (by H. BOIGK, 1956).

of the Rhine River belongs to Germany. The southern part of the Westrhenish region belongs to France. Oil- and gas-bearing beds are of Tertiary age. The deepest part of the graben is near Mannheim, where the Tertiary sediments attain a thickness from 3,500 meters to 4,000 meters. They produce oil from the Lower Tertiary (Oligocene) and gas from the Miocene and Pliocene, respectively. In the northern part of the graben as far as the Worms area, Lower Permian (Rotliegendes) underlies Tertiary. Towards the south, the Tertiary is underlain by Jurassic and Triassic sediments. Apart from one wildcat in the Rotliegend, this deep stage so far has not been explored.

A recently explored oil and gas region is the Molasse basin which is part of a syncline extending in front of the Alps from Austria to Switzerland. In its eastern part, the basin has a width of more than 100 km; the beds are of Tertiary age and of a marine and limnic-brackish facies. Oil fields discovered up to the present lie in the unfolded Molasse. West of Munich, smaller oil fields have been discovered (Möronchst, Heimertingen, and Lauben) which produce from the base of the Baustein beds (sandstone beds) of the Rupel. East of Munich, between Isar and Salzach, mainly gas fields have been found. Only Isen and Ampfing produce gas and oil.

Investigations of the folded Molasse have just been started. The results of wildcat Murnau 1 encourage further exploration. The well found very favorable oil and gas indications in the sandstone beds of the Rupel-Chatt (Oligocene).

Exploration History: In northwestern Germany, early oil exploration was restricted to the investigation of salt domes because, since 1874, oil had been produced from salt-dome flank traps. In the search for salt-dome flank oil fields from 1935-41, a number of other fields at Heide, Mölme, Gifhorn, Reitbrook, Meckelfeld, Ecklingen-Sandlingen, and Fuhrberg were discovered. Two of these fields belong to new types: the accumulations in the top region of salt domes (Reitbrook), and the concentration of oil below large salt overhangs (Eicklingen).

In 1941, another type was added to the existing ones. The Lingen-Dalum field is an anticlinal structure. To the same category belong the oil fields at Georgsdorf and Emlichheim (1944), Rühlertwist and Rühlermoor (1949). All these fields lie in the Emsland area.

The area without salt domes, between the Weser and Ems Rivers, was carefully investigated by geophysical methods; and, in 1951, the Hemmelte-West field was found. In 1953, oil discoveries along fault and overthrust lines were made at Barenburg, Liener, Molbergen, Voigtei, and Aldorf. A connection was established between the old Hannovarian oil region east of the Weser and the Emsland west of the Ems River.

The first oil reservoirs at the margins of Dogger troughs were discovered in the Cornbrash sandstones (Dogger epsilon) in 1952. Oil accumulated along the margins of the Dogger troughs meanwhile discovered below the overlap of the upper Lower Cretaceous (Albian). After the discovery of the field Düste in 1954, it became evident for the first time that facies traps exist in northwestern Germany also. A foundation for present exploration had thus been established.

Investigation of the beds below the evaporites of the Permian, that is the second stage, had already begun in 1938 when the Bentheim gas field was discovered. In 1952 the Rehden field was found, which today is the most important gas field of northwestern Germany. Since the Rehden discovery, far greater attention has been paid to the beds beneath the Upper Permian.

Rhine Valley Graben: In the Rhine valley, graben oil accumulations only occur on top of the faulted structures. The faults dipping mostly antithetically serve as traps, and the accumulation of oil and gas took place in the uppermost horizons. Based upon information obtained from the Pechelbronn oil field at the western marginal fault zone of the graben, the Forst-Weiher field was discovered on the other side of the Rhine valley in 1935. Geophysical investigation proved that the fault-block tectonics also continued within the Rhine valley graben. In search of these structures the first oil and gas field was found at Stockstardt in 1952. Landau, another important oil field, lies in the western margin of the Rhine valley graben. It was discovered in 1935.

Molasse Basin: Of the Molasse basin, as yet only one type of oil field is known, and it lies in the unfolded northern part. It is the type of oil or gas field which occurs at faults which preponderantly strike east-west and dip antithetically. Geophysical and geological work started in 1954 with the discovery of the Isen and Ampfing oil and gas fields. The first oil field in the Baustein beds (sandstone beds) was discovered east of the Iller River, in 1955. Until 1958, the number of gas discoveries east of Munich was increased by nine other fields.

PRODUCTION—1959 Production: Crude-oil production in West Germany rose 15.1% in 1959, to 5.1 million metric tons, or about 99,669 b/d, as against 86,201 b/d in 1958. The rate of increase in 1959 was 2% to 3% higher than in the three preceding years. Most of the increase

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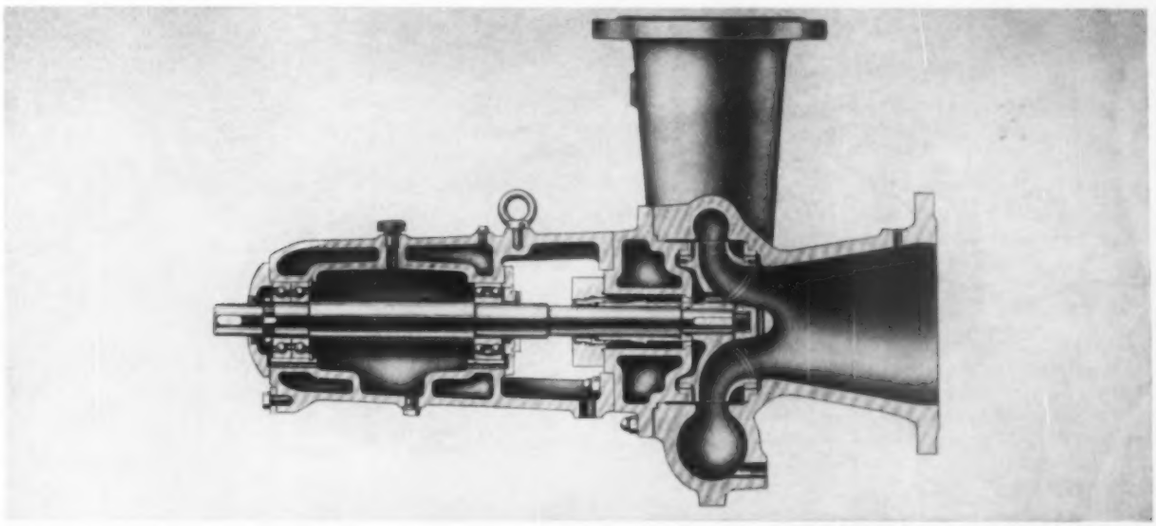

HALBERG pumps type MBS have absolutely stable performance curves. The rise of head from the point of best efficiency to shut off will run from 13 to 20 per cent, so that a satisfactory flow control is possible also in the range of low capacity.

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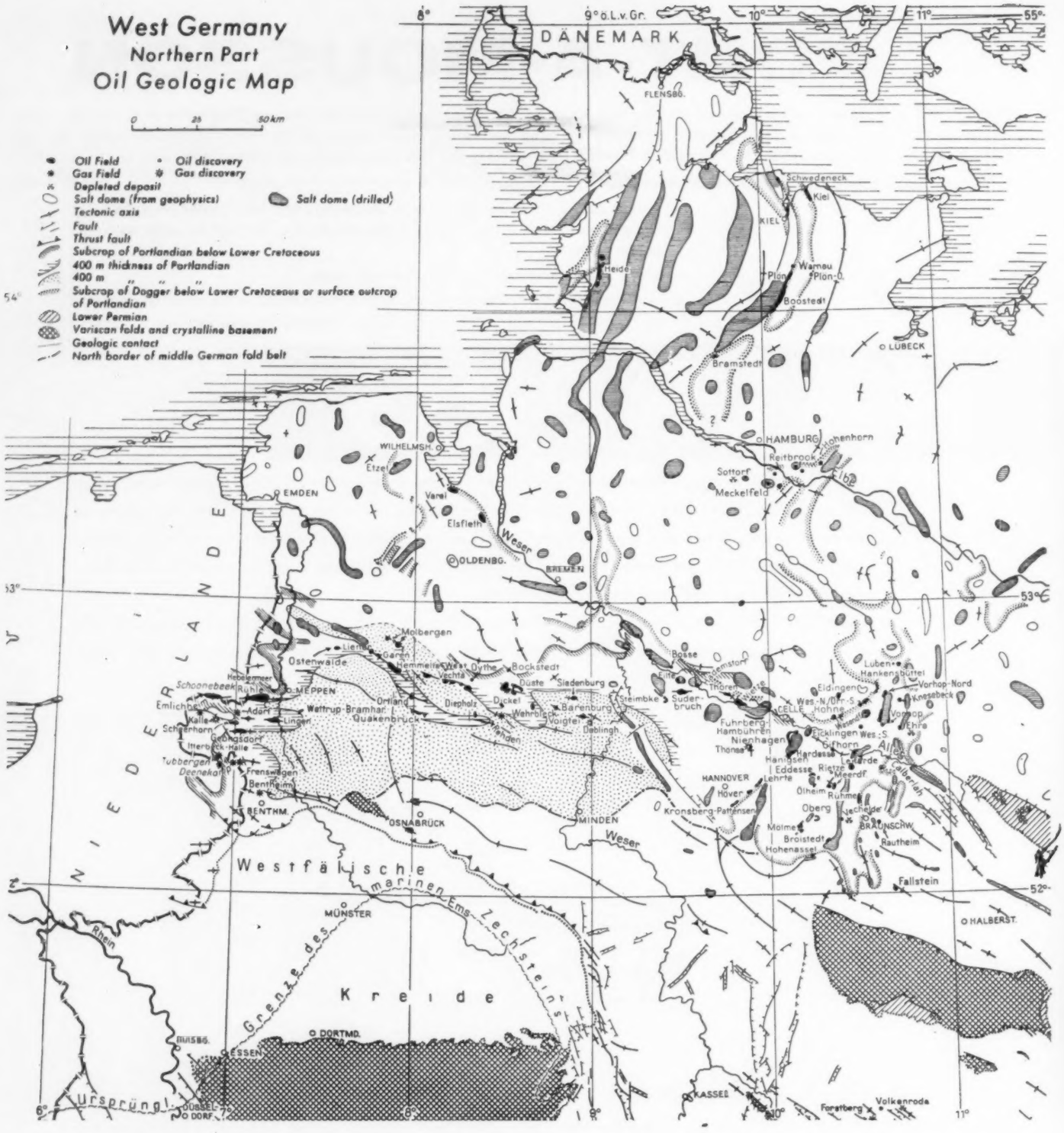
Western Germany



came from the oil provinces of Hanover and Weser-Ems. In Hanover, the field Hankensbuettel near Gifhorn is top producer, while in the old production area of Nienhagen-Haenigsen, due to the development of a new block, the annual yield could be stepped up to 153,000 tons. In the weser-Ems district, the annual output of the Vechta area could be improved by 71,000 tons. In the Alpine Foreland, crude production nearly doubled; however, up to now no major find has been made here.

Natural-gas production of West Germany reached about 387 million cubic meters in 1959, i. e., about 43 million cubic meters more than in the preceding year. After the Bavarian Steinkirchen gas field has been linked with the pipline system leading to Munich and the output of the gas field Weitermuehle has been raised further, total gas production of Bavaria could be more than doubled.

Producing companies in the Emsland province have made new agreements with the Ruhrgas AG by which the quantity of gas delivered to Ruhrgas will in the future increase considerably.

Production History[1]: The history of German oil production begins with the year 1858, when

(*Continued on page 211*)

[1]For an excellent history of German oil and gas, see *The Development of Crude-Oil and Natural-Gas Production in the Federal Republic of Germany*, by Dr. H. Pfefferkorn, Wirtschafts Verband Erdoelgewinnung ev. Hannover, *World Petroleum*, Sect. II (GERMANY), p. 12, June 1959.

Gas

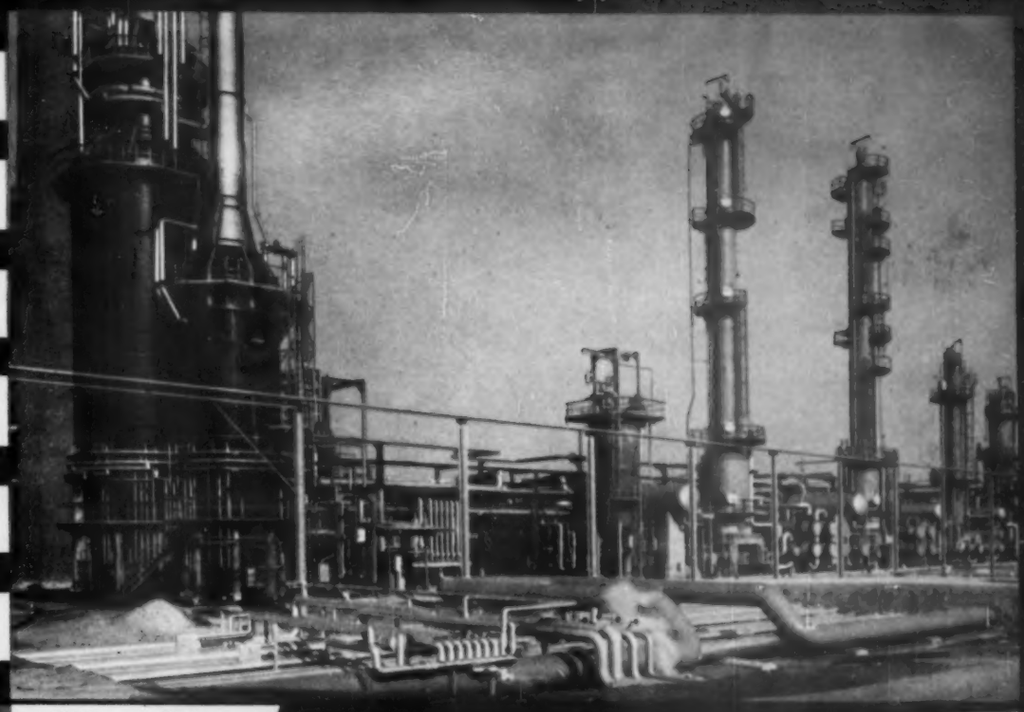
Motor fuels

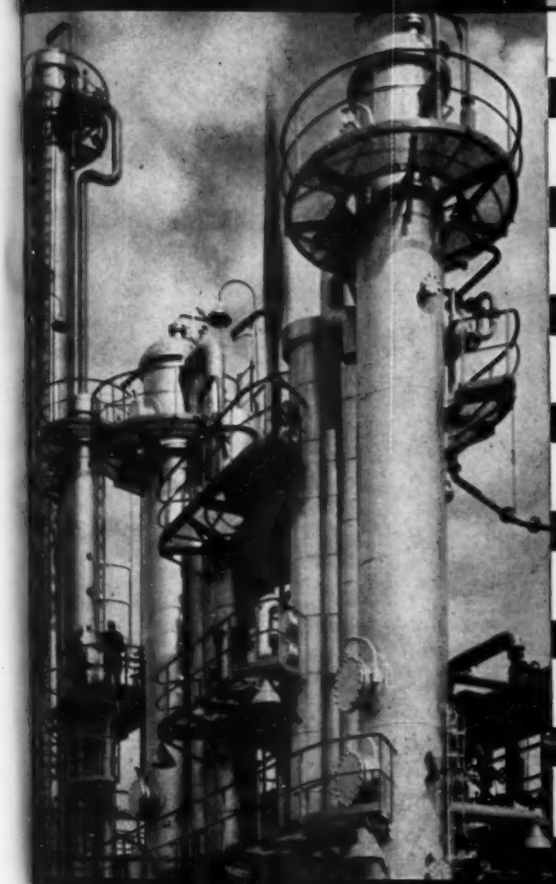
Gas oil

Lube oil

Fuel oil

Asphalt





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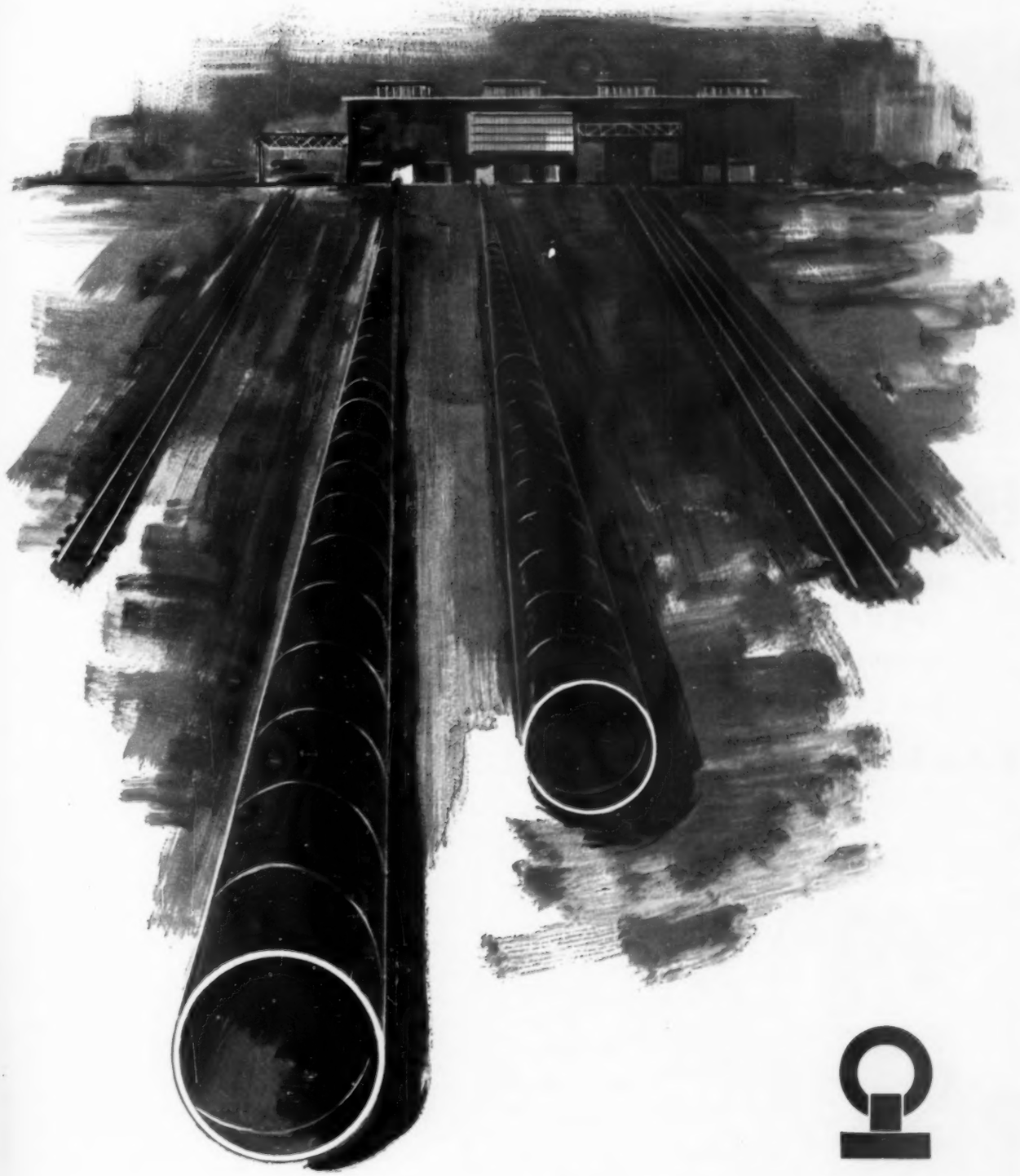

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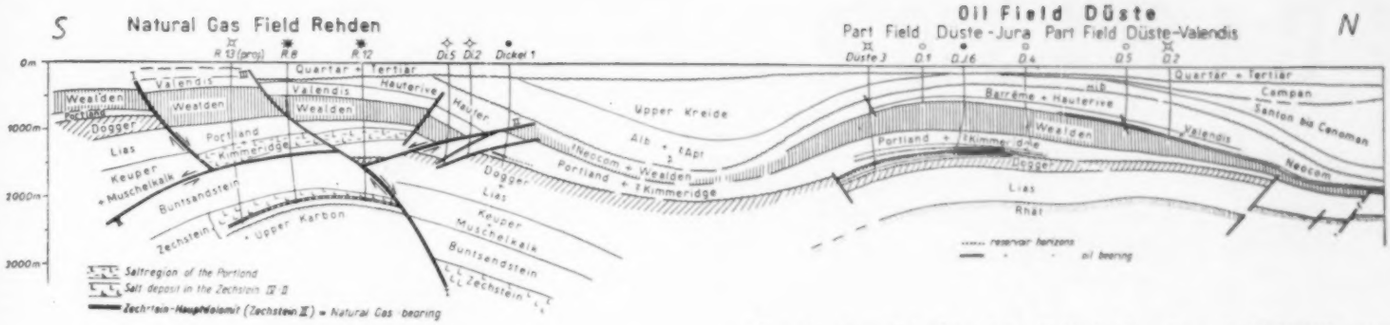

S-N section through the Oil and Gas Fields Rehden—Düste (by E. BRAND, 1956).

a German geologist found oil near the German village of Wietze located on the Aller River in the big North German sedimentary basin. However, commercial production in Germany did not start until after 1871. Actually, the first commercially exploited field was not Wietze, but Pechelbronn in Alsace, which in 1871 had a daily output of about 5 bbl. Wietze, for many years Germany's largest oil field, did not begin to produce until 1874. Around the same time several other North German fields, all located between the Elbe and the Weser Rivers, were found. North of the Elbe, a field was located at Heide-Holstein; while, in southern Germany, Tegernsee was discovered in the Bavarian Molasse trough. All these fields were tied to salt domes and, with the exception of Wietze and Pechelbronn, their output was insignificant. Pechelbronn produced over 1,000 b/d by 1918, when Alsace was lost to France; while Wietze reached a record daily output of 2,000 bbl in both 1908 and 1909.

It is noteworthy that virtually all these fields discovered in those very early days of German oil production are still commercial producers. Thus Wietze, now under concession to DEA, produced about 600 b/d in 1956; Heide supplied 1,633 b/d; while output at Pechelbronn—now owned by the French company Pechelbronn SA—amounted to 660 b/d. Oedesse-Oelheim, whose production of 120 b/d in 1882 had caused a real German "oil rush" (bringing the whole industry into a temporary slump when a sharp decline set in the next year), is now producing about 900 b/d for the German public and government-owned firm Preussag.

After World War I, exploration activities in Germany became more active; and geophysical surveys, as well as rotary drilling, were introduced. These activities were necessary to prevent a complete expiration of German crude-oil production which seriously threatened right after 1918. The record production up to then had been in 1910, when the national output stood at nearly 3,000 b/d. From then on until 1918, there was an annual decline. At the end of the latter year Pechelbronn, which accounted then for almost 60% of Germany's total production, became part of France—with the result that Germany's oil output was down to the insignificant amout of some 700 b/d.

The exploration activities after World War I were carried on mostly by the Deutsche Erdoel AG (DEA), Preussag, Wintershall AG, the German Vacuum Oil Co., German Shell AG, and Esso AG. Up to 1934, the activties of these companies did not result in any new discoveries, but it was possible to increase output from existing fields. Thus, by 1930 the 1910 record for the first time was surpassed with an output of 3,400 b/d.

In 1930, the number of producing oil fields was still limited to the five following "classic" fields.

Field	*Tons Per Year*
Wietze	61,077
Oedesse-Ölheim	14,181
Tegernsee	17
Nienhagen	83,772
Oberg	10,562

By 1933, a further increase to 4, 750 b/d had taken place. The increase was due partly to conventional secondary-recovery methods and partly to the "mining" of oil in certain areas. This consisted of bringing the oil-bearing sands to the surface by mining methods and then washing the oil out of the sands. Such an operation was carried on throughout the interwar period at Heide, and is still being carried out at Wietze, where it yields about 550 b/d. Though the national output in 1933 represented a record for Germany, it was still only a very insignificant figure measured by the country's potential capacity as it was then believed to be. The two fields (Nienhagen and Wietze), which accounted for 80% of Germany's total output in that year, had been discovered, respectively, 30 years and 60 years previously.

The reason for this lack of new commercial discoveries was not so much inability to find new fields as the then-prevailing low levels of world oil prices which made it difficult for the high-cost German wells to compete with imported oil. This is shown by the fact that after 1933, when the government took a direct interest in making Germany less dependent on imported commodities of any kind, exploration activities and new field discoveries immediately began to soar. Thus while in 1933 there were only four producing oil fields (following 60 years of exploration and surveying activities), in 1939 there were already 19 fields producing a total of nearly 15,000 b/d. By the end of World War II, the number of fields had risen to 27.

The measures taken by the German government to encourage production consisted of three main steps, all taken in 1934-36: (1) A government decree ordering a complete geophysical survey of Germany for the purpose of locating new oil structures: The survey was put in the hands of the Prussian Geological Institute which, in turn, was given jurisdiction over the geological institutes in the other German states

OIL AND GAS EQUIPMENT

There is considerable oil and gas equipment available in Germany, much of it made to specifications of the American Petroleum Institute. Among the materials available and meeting specifications are the following:

GERMANY
PARTIAL LIST OF OIL EQUIPMENT AVAILABLE

Oil Country Tubular Goods (casing, tubing)
Line Pipe
Structural Steel
Chain
Abrasives
Tools
Valves
Fittings
Electric Motors
Cathodic Protection Equipment
Diesel Engines
Railroad Cars—Vans—Reefers
Compressors
Forklift Trucks
Asbestos Cement Products
Plumbing Fittings
Cable
Manila Rope—Peron Rope
Hose
Paints
Bearings
Hydraulic Jacks
Cement Lined Pipe
Copper Tubing
Boiler Tubes
Finned Tubes
Valves
Steel Bars (Carbon—Alloy)
Insulation
Electric Wire
Steel Conduit
Bulbs
Teletype Equipment
Pumps
Refractories
Pressure Vessels, Columns, Drums, Heat Exchangers
Steel Storage Tanks
Orifice Flanges
Sodium CMC
Oilwell Cement

GERMANY (WEST)—Crude-Oil Production, 1959—Tons

	Metric Tons
Alpine Foothills	
Albaching	235
Ampfing	73,207
Heimertingen	2,582
Hohenlinden	273
Isen	24
Lauben	3,503
Moenchsrot	31,750
Moosach	2,064
Oedgassen	103
	113,741
Emsland	
Adorf	112
Emlichheim	144,166
Georgsdorf	306,628
Hebelermeer	19,914
Lingen	102,785
Meppen	15
Ruehlermoor	461,295
Ruehlertwist	157,625
Scheerhorn	160,156
	1,352,696
Hanover	
Broistedt	7,092
Calberlah	211
Eddesse	35,701
Ecklingen-Sandlingen	9,952
Eilte	61,309
Eldingen	92,972
Fuhrberg-Hambuehren	29,418
Gifhorn	1,177
Hademstorf	3,740
Hankensbuettel	362,862
Hardesse	3,691
Hohenassel	15,003
Hohne	217,334
Lehrte	68,084
Leiferde	116,864
Lichtenhorst	422
Lueben	55,632
Meckelfeld	25,274
Meerdorf	3,312
Moelme	14,293
Nienhagen-Haenigsen	271,519
Oberg	5,004
Oerrel-Wesendorf-Nord	76,105
Rautheim	132
Ruehme	26,513
Steimbke	39,272
Suderbruch	136,030
Thoeren	11,960
Vorhop	85,831
Wesendorf	61,594
Wesendorf-Sued	3,442
Wietze	23,687
	1,865,432

	Metric Tons
Holstein	
Boostedt-Ploen	168,052
Bramstedt	90,624
Heide	65,448
Kiel	13,551
Ploen-Ost	28,144
Reitbrook	45,702
Schwedeneck	36,841
Warnau	1,419
	449,781
Upper Rhine Valley	
Buechenau	168
Deidesheim	107
Dudenhofen	3,454
Eich	749
Forst-Weiher	626
Graben	985
Hayna	183
Hofheim	1,477
Huttenheim	950
Knielingen	1,753
Landau	89,460
Leopoldshafen	8,505
Maximiliansau	797
Minfeld	6,393
Neureut	2,478
Offenbach	4,171
Rheinzabern	381
Rot	3,512
Stockstadt	49,164
Wattenheim	1,244
Weingarten	1,824
	178,381
Weser-Ems District	
Barenburg	158,773
Bockstedt	21,978
Bramhar-Wettrup	29,825
Dickel	13,880
Diepholz	4,083
Dueste	317,789
Elsfleth	30,576
Etzel	255
Hemmelte-West	118,581
Liener-Garen	5,220
Loeningen	285
Molbergen	12,984
Ortland	32,448
Ostenwalde	36,459
Oythe	582
Quakenbrueck	1,371
Siedenburg	22,260
Varel	15,141
Vechta	127,848
Voigtei	169,868
Wehrbleck	22,754
	1,142,960
Total:	5,102,991 (99,660 bbls/day)

GERMAN OIL PRODUCTION—1871 to 1959

(Metric Tons)

1871	267	1901	44,095	1931	228,522
1872	409	1902	49,725	1932	229,799
1873	1,700	1903	62,680	1933	238,511
1874	892	1904	69,620	1934	314,635
1875	781	1905	78,869	1935	429,678
1876	592	1906	81,350	1936	444,653
1877	865	1907	106,379	1937	453,339
1878	845	1908	141,900	1938	552,074
1879	1,895	1909	143,244	1939	740,783
1880	1,309	1910	145,168	1940	1,056,137
1881	4,108	1911	142,992	1941	901,306
1882	8,158	1912	134,986	1942	742,754
1883	3,755	1913	121,082	1943	711,168
1884	6,490	1914	110,347	1944	721,936
1885	5,815	1915	99,258	1945	547,441
1886	10,385	1916	92,664	1946	649,711
1887	10,444	1917	90,643	1947	576,617
1888	11,920	1918	89,323	1948	635,240
1889	9,591	1919	37,440	1949	841,576
1890	15,226	1920	35,026	1950	1,118,616
1891	15,340	1921	38,385	1951	1,366,685
1892	14,527	1922	41,995	1952	1,755,430
1893	13,974	1923	50,770	1953	2,188,703
1894	17,465	1924	59,352	1954	2,666,321
1895	17,051	1925	79,124	1955	3,147,234
1896	20,395	1926	95,421	1956	3,506,219
1897	23,303	1927	96,904	1957	3,959,633
1898	25,987	1928	92,029	1958	4,431,596
1899	27,027	1929	103,306	1959	5,100,000
1900	50,375	1930	173,859		

for the purpose of the survey. (2) A Reichs drilling program was instituted under which private industry was given government loans covering up to 50% of the drilling costs: the loans had to be paid back only if oil was discovered. (3) Oil in the ground ceased to be the private property of the landowner and became automatically the exclusive property of the State which alone had the right to engage in oil exploration and exploitation activities. However, the State could transfer the exercise of this function to other persons, i. e., private individuals who were given licenses. In return, they were obligated to carry on such exploration and exploitation activities as requested by the government; to keep the government informed of all geological findings; not to cease their oil activities without the government's permission; and to pay the government a royalty equal to 5% of the prevailing crude-oil or natural-gas price (under a "grandfather" clause, in the case of concession agreements made with private landowners prior to 1934, the 5% royalty had to be paid to the latter).

The combination of these decrees—which are all *still valid today* (except for the drilling loan program)—brought about the successes of the following years. They made possible the almost complete geophysical survey of northwestern Germany which added 180 new salt domes to the 50 already known, and they stimulated an increase of total drilling from 74,000 meters in 1933 to nearly 153,000 in 1935 and 300,000 in the last full war year. A large part of this was financed by the above-named government drilling loans which paid for some two-thirds of all exploratory drillings from 1934 to 1945.

The major importance of all these activities was that it resulted: (1) in the discoveries of oil not only on the side of salt domes, as heretofore, but also above them; and (2) in the location of oil deposits which had nothing to do with salt domes. The first of these developments led to the discoveries of such important fields as Reitbrook and Heide, both located north of the Elbe River where (except for a very insignificant output at Heide) no oil had ever been produced. The second development brought the discoveries of the fields west of the Ems River, which have since become the country's largest in both production and reserves. It also led to the discovery of the large natural-gas field at Bentheim in the same area, and of

GERMANY (WEST)—Annual Crude-Oil Production Increase (Per Cent)

Year	Increase Over Previous Year
1950	33.0
1951	22.0
1952	28.5
1953	24.7
1954	21.8
1955	18.0
1956	11.4
1957	12.9
1958	11.9

GERMANY (WEST)—Domestic Crude Oil As A Percentage of Total German Refinery Input

Year	%
1945	100
1946	100
1947	95.6
1948	74.7
1949	45.2
1950	34.3
1951	28.3
1952	32.0
1953	32.1
1954	30.9
1955	31.0
1956	30.6
1957	32.7
1958	29.2
1959	24.5

GERMANY (WEST)—Crude-Oil Production

(Metric Tons)

Year	Oil Fields	Production
1930	5	174,070
1935	11	427,362
1940	21	1,056,238
1945	28	547,453
1950	39	1,118,633
1951	40	1,366,685
1952	41	1,755,406
1953	48	2,188,696
1954	61	2,666,314
1955	70	3,147,234
1956	83	3,506,219
1957	81	3,959,641
1958	82	4,431,596

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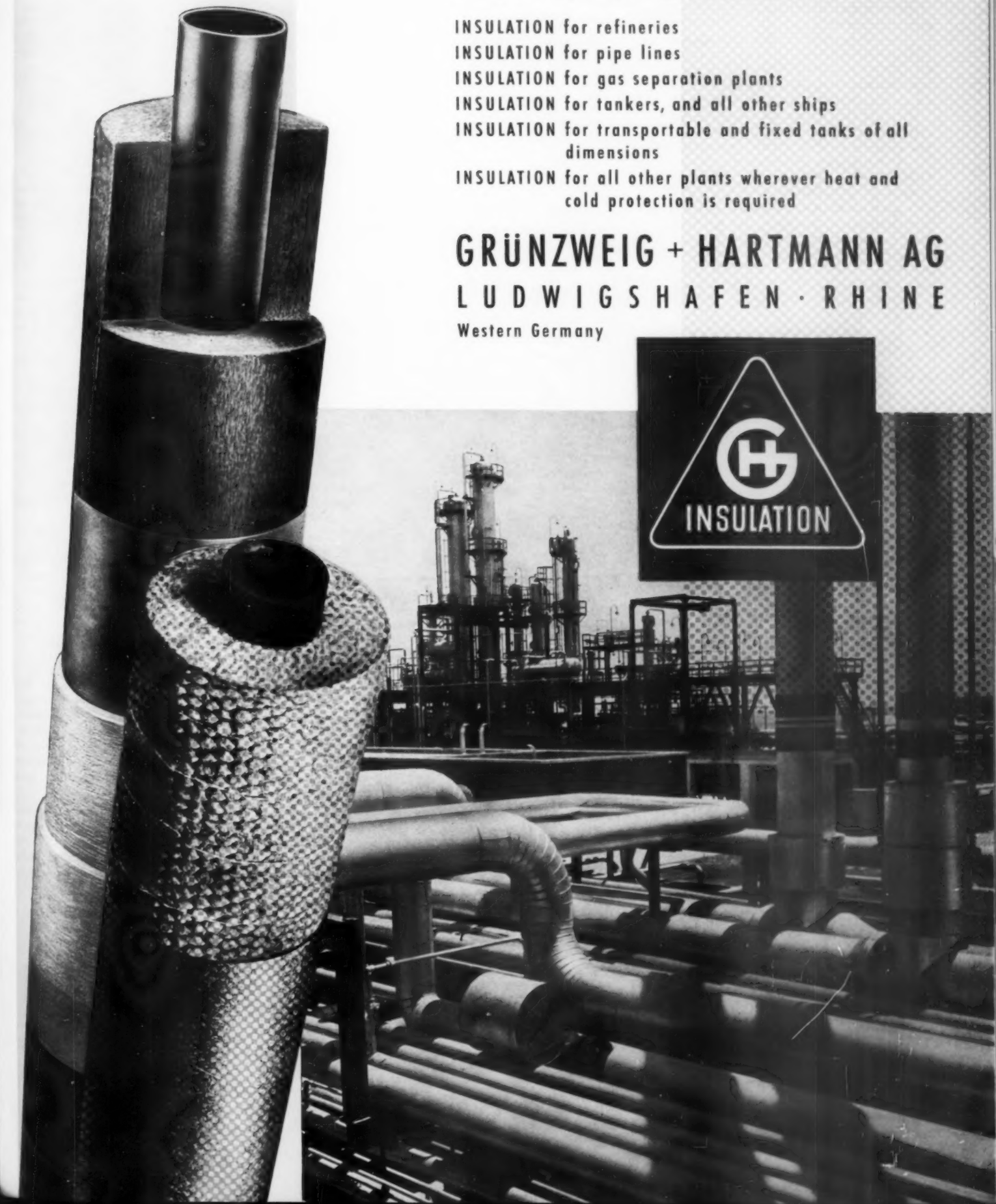

the first commercial oil discoveries in the upper Rhine valley.

At first, wet natural gas produced with the crude oil was used only for internal purposes of servicing, such as heating, driving of engines, or as input for small carbon plants. Later, however, the discovery of the first natural-gas field (dry gas) at Bentheim led to industrial utilization. Continuous deliveries of natural gas have been obtained from this field since 1944, following the completion of an 80 km pipeline.

Efforts of the German oil industry to contribute primary energy sources to the continuously increasing needs of the country proved successful in recent years. In different areas of the Federal Republic of Germany, such as the North German plains, the Rhine valley, and the northern region of the Alps (new natural-gas fields were continuously discovered and prepared for economic use during the period 1951-58. At present there are in operation 15 structurally independent natural-gas fields, with approximately 70 producing dry-gas wells.

A decline in output in the last two years is explained by the temporary decreasing needs of consumers, and is not due to the field potentialities.

The importance of this period, which came to an end with Germany's military debacle in April 1945, is shown by the following figures which divide German oil production into three major phases:

Cumulative Oil Production, 1871-1958

		Millions of Tons	%
I.	1871-1933	3,745	9.8
II.	1934-1944	7,069	18.5
III.	1945-1958	27,346	71.7
Total	1871-1958	38,160	100.0

According to these figures, nearly twice as much oil was found in the 10-year span of the second phase than in the 62-year span of the first phase. Of course, the figures also show the very large extent to which the German oil industry is really a post-World War II development. In fact, the second phase, though highly successful on a cumulative basis, was marked by a steady annual production decline after the peak of over one million tons (20,000 b/d) reached in 1940. The decline was due mainly to the wasteful over-exploitation of all fields in order to fuel the German war machine.

Thus, in 1945, total oil production was again back to the 11,000 b/d of 1938. Until 1948, this level was just about being maintained. However, following the currency reform and consequent economic upswing of that year, oil activities took an immediate upward jump, and have been on the increase ever since.

The postwar period brought many of the new exploration and exploitation techniques to Germany which had been developed in other parts of the world in the eight to nine years during which the country had been out of touch with the world oil industry. The new geophysical methods helped to locate a connecting chain of oil fields between the "historic" fields around Hannover (the territory between the Aller and the Weser Rivers) and the more recent discoveries in the Emsland (west of the Ems River). The fields in this connecting chain (located between the Weser and Ems) are generally not tied to salt domes.

The first major field discovered in this period was Suderbruch (1949), located on a concession held by Gewerkschaft Brigitta, a jointly owned subsidiary of Esso and Shell. This was followed by the discovery of Eldingen in the same year. Both these fields, which are among Germany's largest, are situated in the Elbe-Weser territory. In the same year, two major discoveries were made in the Emsland: Scheerhorn and Ruehlermoor; the latter is now Germany's biggest single field with an output of about 8,800 b/d. Shortly after that, oil activities spread to several new areas with the discoveries of Bramstedt, Ploen, and Boostedt in Schleswig-Holstein, north of the Elbe River. This area is still not important as an oil-producing center, but its eight fields are currently supplying a total of about 8,600 b/d. Far more important became the area between the Weser and the Ems which, as was mentioned above, linked the Emsland fields with the old oil fields in the Hannover area. The Weser-Ems area contained only one small field (Etzel) until 1950. Since then, 20 new fields have been established there with a total production of some 22,000 b/d in 1959. The Weser-Ems area contains also Germany's largest natural-gas field, Rehden, discovered in 1954. Rehden's current production of 11, 760 mcf (thousands of cubic feet) daily is equivalent to about one-third of Germany's total output from natural-gas wells.

The next development occurred in the upper Rhine valley, where a number of new fields were added to the two small discoveries made in the mid '30's. However, this area has so far not developed into an important producer, its total output from 20 fields in 1959 being only about 3,300 b/d. Still more recent is the small commercial production in Bavaria which up to 1954 contained only the minute noncommercial field at Tegernsee. Now nine new fields in the area produce a total of 2,100 b/d, and output is on the rise.

The most important aspect of the phase of the German oil production which started after 1945 is that, though production rose by nearly 10 times since then to an estimated 102,000 b/d (5.1 million tons) for 1959, this increase has not been obtained through a depletion of the country's reserves, which have been growing every postwar year.

Reserves: According to estimates of the German Geological Survey (Amt fuer Bodenforschung), together with the oil companies, the German Federal Republic had at the beginning of 1959 proved reserves of 57.4 million metric tons (about 409.2 million barrels) of crude oil, plus probable reserves of 17.5 million tons. The total of 74.9 million tons is approximately six million tons higher than one year previously.

On January 1, 1950, proved and probable reserves were estimated at 36.5 million tons, while nine years later—after 24.1 million tons had been withdrawn—they were estimated at 75 million tons. The distribution of the reserves throughout the country's six main oil bearing areas are given in an accompanying table.

Of interest is also the change in the share of each oil producing area in Germany's total production. As shown in an accompanying table, the most important change has been the growth of the area west of the Ems River and the area between the Ems and the Weser. In 1945, these two regions accounted for not quite 6% of Germany's total production. By 1956, their combined share had risen to a peak of about 50%, and has remained more or less stabilized at this level. The corresponding decline has occurred in the areas north of the Elbe and between the Elbe and Weser Rivers. However, this decline does not reflect a lowering of physical output but, rather, a more rapid growth of the other areas. In fact, actual production north of the Elbe and between the Elbe and Weser has increased each year since 1949.

Predictions for the future indicate that from 1961 on, the actual output, as well as the share in the total production of the various existing areas, will decline while the output from newly explored areas will grow. Total German output,

(Continued on page 218)

GERMANY (WEST)—Projected Crude-Oil Production Based on End of 1958 Situation
(Metric Tons)

PRODUCTION AREA	ACTUAL PRODUCTION 1958	ESTIMATED PRODUCTION IN CALENDAR YEAR 1959	1960	1961	1962	1963
North of Elbe	447,317	431,100	409,500	387,300	360,100	331,900
Between Elbe & Weser	1,538,713	1,725,359	1,706,408	1,627,004	1,534,804	1,443,780
Between Weser & Ems	951,526	1,084,625	1,119,100	1,119,500	1,076,200	1,035,900
West of Ems	1,283,469	1,343,400	1,309,400	1,277,400	1,248,400	1,239,400
Upper Rhine Valley	149,242	183,150	170,500	159,200	148,900	138,100
Bavaria	61,329	119,700	133,000	121,200	98,400	78,200
TOTAL	4,431,596	4,887,334	4,847,908	4,691,604	4,466,804	4,267,280
Growth from new areas		125,000	300,000	560,000	950,000	1,300,000
Accrued total	4,431,596	5,012,234	5,147,908	5,251,604	5,416,804	5,567,280
Growth rate		580,738	135,574	103,696	165,200	150,476

Source: Wirtschaftsverband Erdoelgewinnung.

GERMANY (WEST)—Share of Producing Regions in Total Production
(Per Cent)

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	*1959
North of the Elbe	22.8	16.7	15.7	14.0	11.7	10.0	8.7	7.6	8.6	9.9	11.2	11.7	11.2	10.8	8.9
Between Elbe & Weser	70.5	69.2	62.7	57.9	48.7	42.7	45.8	46.4	42.2	36.9	35.5	34.7	34.1	34.7	36.4
Between Weser & Ems	0.3	0.7	0.7	0.7	0.3	1.7	1.0	2.5	7.7	11.9	14.7	17.0	19.6	21.5	22.3
West of Ems	5.6	12.3	19.8	26.4	38.6	45.1	44.0	43.1	39.9	38.7	35.7	33.4	31.3	29.0	26.8
Upper Rhine Valley	0.8	1.1	1.1	1.0	0.7	0.5	0.5	0.4	1.6	2.6	2.6	2.7	3.0	3.4	3.4
Bavaria											0.3	0.5	0.8	1.3	2.2
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total production (in (million tons)	0.55	0.65	0.58	0.65	0.84	1.12	1.37	1.75	2.19	2.67	3.15	3.51	3.96	4.43	5.01

*Preliminary.

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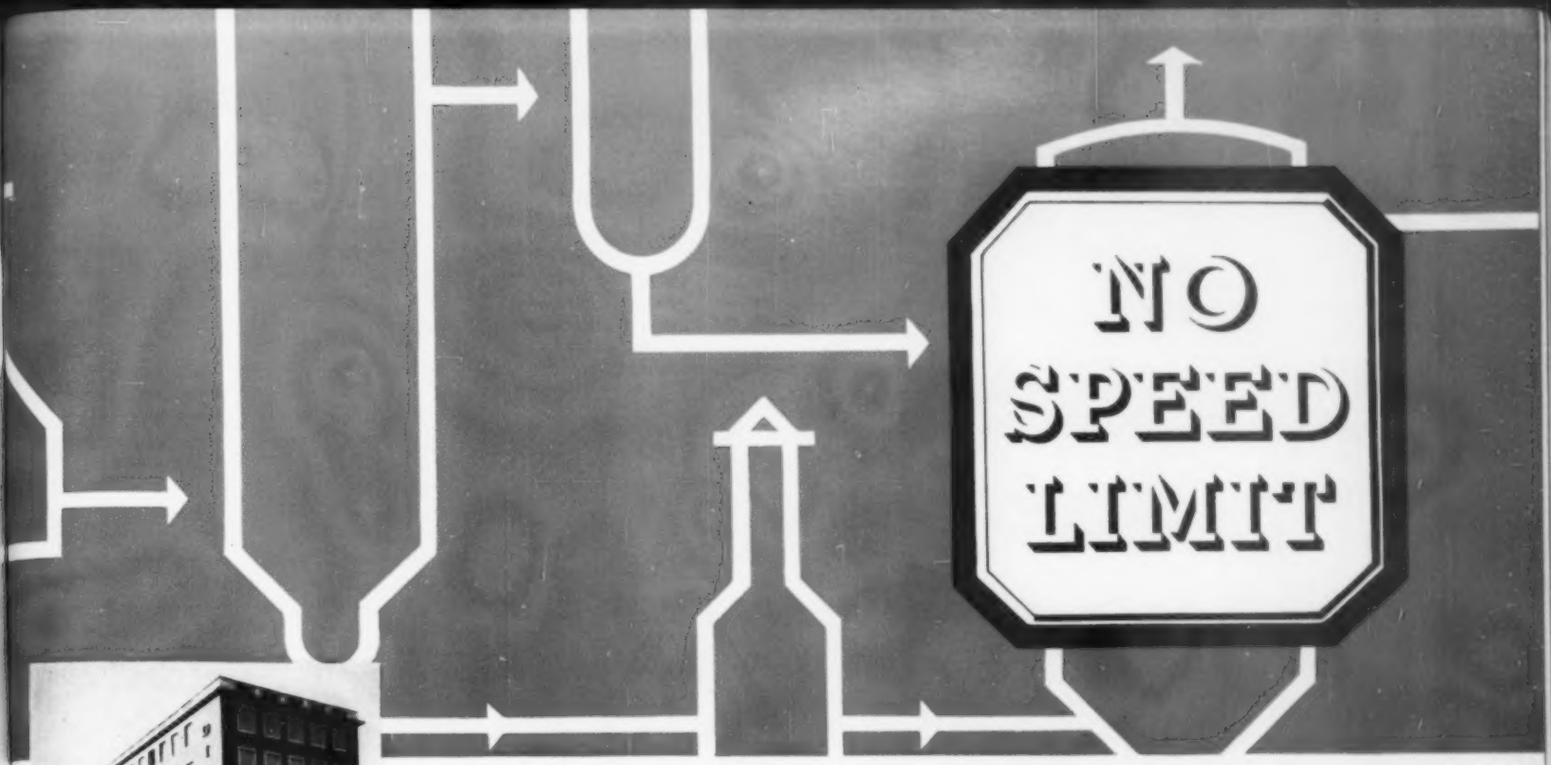

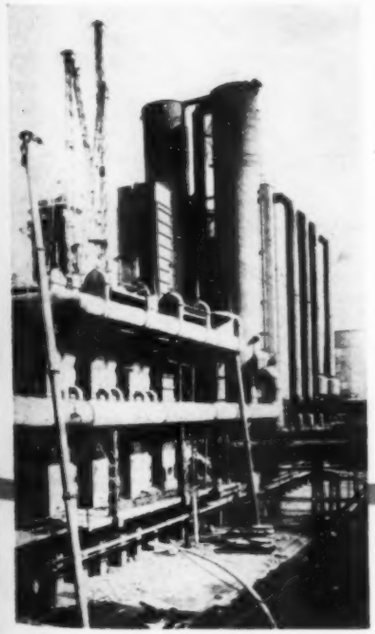

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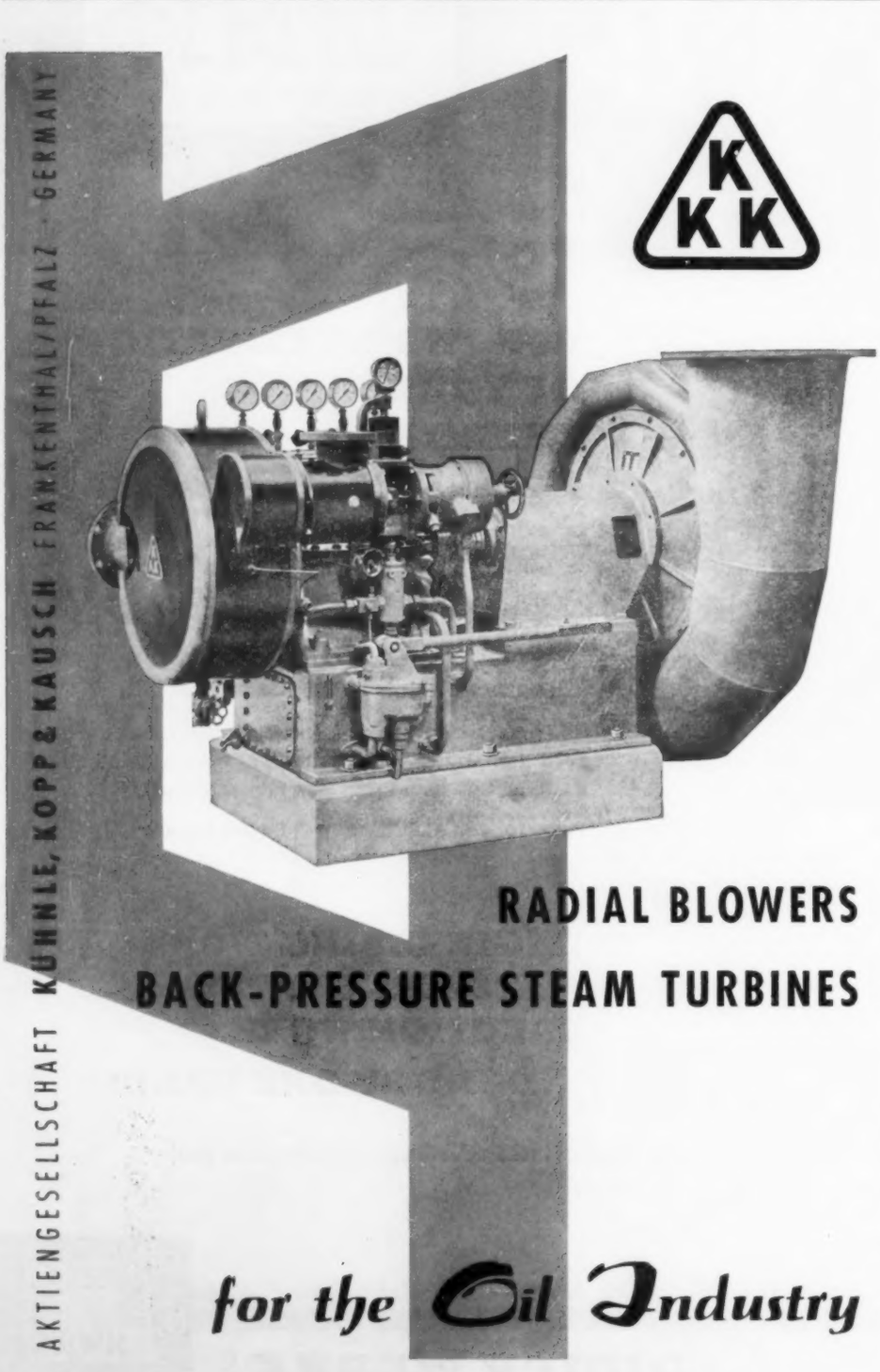
GERMANY (WEST)—Distribution of Crude-Oil Reserves
(As of January 1, 1958 and 1959)
(Metric Tons)

Area	Proved 1958	Proved 1959	Probable 1958	Probable 1959	Total 1958	Total 1959
North of Elbe	3,382-	3,879	1,140-	920	4,522-	4,709
Between Elbe & Weser	20,223-	20,837	4,491-	4,071	24,714-	24,908
Between Weser & Ems	11,207-	14,190	4,270-	6,591	15,477-	20,781
West of Ems	16,620-	15,980	4,200-	4,540	20,820-	20,520
Upper Rhine Valley	1,683-	1,679	1,005-	840	2,688-	2,519
Bavaria	280-	885	285-	585	565-	1,470
TOTAL	53,395-	57,360	15,391-	17,547	68,786-	74,907

GERMANY (WEST)—Crude-Oil Reserves (Tons*)
(As of January 1, 1959)†

	Proved	Probable	Total
Holstein	3,789,000	920,000	4,709,000
Hanover	20,837,400	4,071,000	24,908,400
Weser-Ems District	14,190,000	6,591,000	20,781,000
Emsland	15,980,000	4,540,000	20,520,000
Upper Rhine Valley	1,679,200	840,000	2,519,200
Alpine Foothills	885,000	585,000	1,470,000
	57,360,600	17,547,000	74,907,600

*One metric ton equals 7.1 bbl.
†Estimated.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however, will change its rate of absolute growth after 1960, as shown in the accompanying table on projected production.

The trade estimates in the table on projected production are likely to be on the conservative side, as they have been invariably in the past. Nevertheless, the estimates show that the high annual production increases which had characterized the earlier postwar development of the German oil industry are not likely to recur. In fact, these increases have already become flattened out in the past few years.

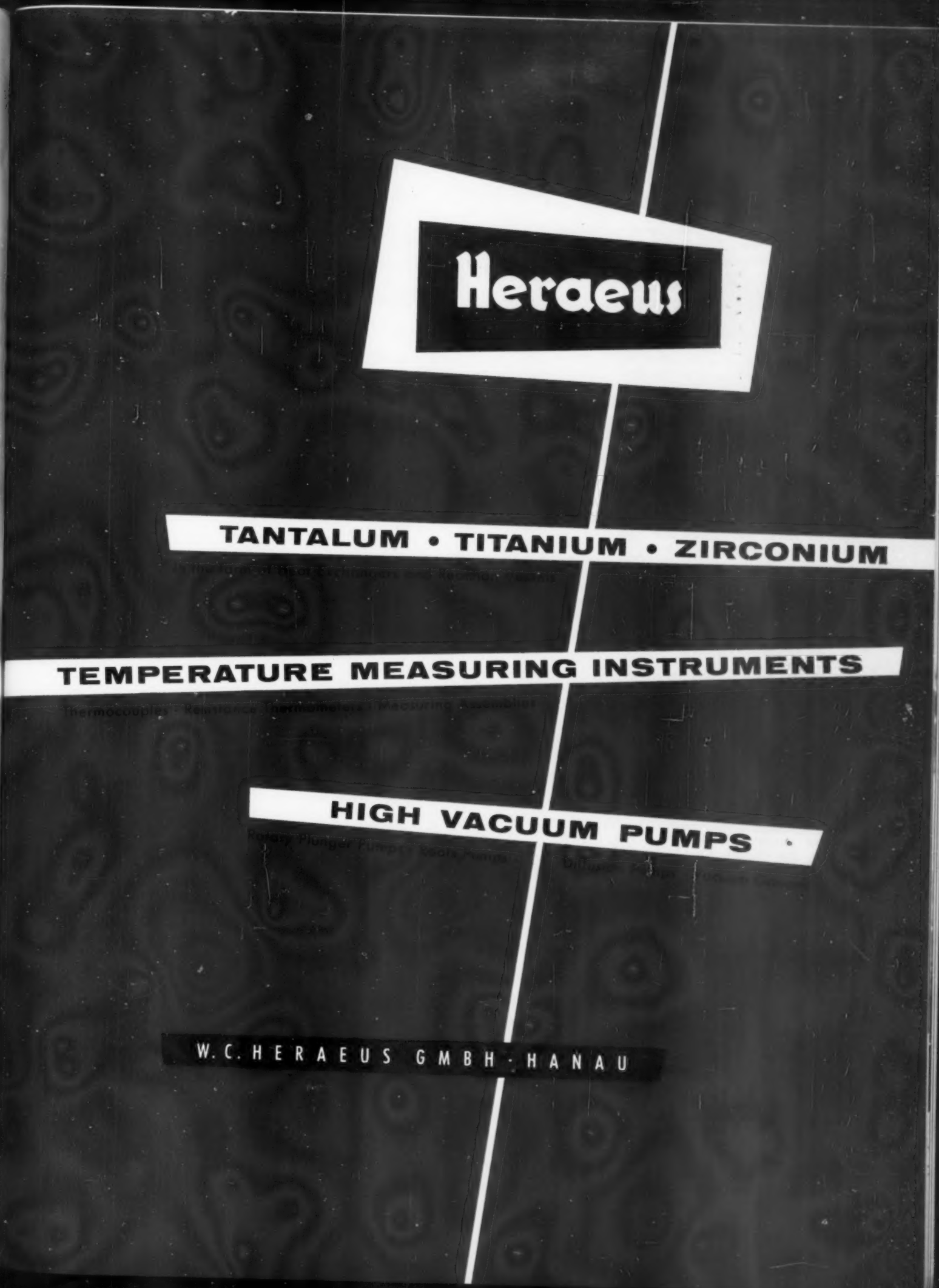
In 1959, the production increase was somewhat above that in 1958, while for 1960 it will amount to less than 3%, according to industry predictions; and after that new discoveries will only slightly more than offset the decline from established fields. Of course, these predictions are made only for the period until the end of 1963. Beyond that, there are as yet no reliable production estimates. Furthermore, as stated before, they probably err on the conservative side.

The main problem faced by the German crude-oil industry is its high production cost. At present the average cost per barrel is over $5.00, which makes German oil totally noncompetitive with most foreign oil. Since the increase in the country's future oil production will have to come from new fields rather than from a higher output of existing ones, the production costs may be expected to rise still further.

To protect the country's domestic production, a very high duty rate on crude oil (approximately $4.40 per barrel) has been in existence since 1951. Under the European Common Market treaty which went into effect in January 1958, Germany may retain this protective duty for six more years. After that, it is scheduled to be abolished. However, the treaty gives Germany the right to institute a State subsidy to protect is crude-oil ouput following the removal of duties. This subsidy may have to be removed after the Common Market treaty has been in existence for 10 years, if a majority of the six member countries so decide.

Despite the steady increase in German oil production, Germany's share in the total domestic refinery input is now on the decline after having maintained itself at a level of 30% to 33% for nearly a decade, as shown in an accompanying table. Thus, German crude-oil production seems destined to provide an increasingly marginal part of the country's total oil needs. Hence, in the future, Germany is likely to become just as dependent on overseas oil supply sources as the rest of Western Europe.

REFINING AND MARKETING (1959): Two new refineries were put onstream in 1959, viz., Esso, in Cologne, and Purfina, in Duisburg-Neuenkampf. Esso Cologne is the first of the new refineries which are to be built on the lower Rhine. The throughput capacity of this plant is 3.5 million tons of crude annually, or 72,000 b/d. The crude is supplied through the new pipeline leading from Wilhelmshaven to Cologne in which Esso has a 47.2% share. To improve the quality of the straight-run gasoline, a Powerformer was erected at the site of Esso Cologne with a throughput capacity of about 350,000 tons annually. Hydrogen from the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Powerformer is employed for desulfurizing gas oil and jet fuel in one small and one major Hydrofiner, which both together have a throughput of 2,400 cubic meters daily, or about 650,000 tons annually. Furthermore, a steam-cracker with a capacity of 200,000 tons annually is to work up light gasoline from the topping unit.

Further to the north, at Duisburg-Neuenkampf, the Purfina Mineraloelraffinerie AG, affiliate of the Belgian Petrofina group, started operations late in 1959. This plant has an annual throughput capacity of one mililon metric tons, i. e., 20,000 b/d.

At the Lingen refinery of Gewerkschaft Erdoel-Raffinerie Emsland, a new processing plant with an annual input capacity of 1.5 million tons was added in 1959, thus increasing the total capacity of the works to 2.5 million tons, or 53,000 b/d. Lingen also built up a UOP Platformer (4,000 b/d) and a diesel-oil desulfurization plant operating on the Shell-Trickle method. In Lingen, besides indigenous crude from the nearby Emsland fields, crude from Iran and Iraq, pumped through the Wilhelmshaven pipeline, is being treated.

At the beginning of 1959 a new distillation unit, with an annual throughput capacity of three million tons of crude, was put onstream at Gelsenberg Benzin AG, Gelsenkirchen. The total crude input capacity of Gelsenberg now amounts to 4.5 million tons annually, or 95,000 b/d.

In 1960, the new refineries of Shell at Godorf near Cologne (53,000 b/d), BP at Dinslaken (85,000 b/d), and Frisia at Emden (32,000 b/d) will be completed.

Other refineries enlarging their capacities include Deurag-Nerag at Hannover-Misburg; Wintershall AG at Salzbergen (Emsland), and Kleinholz & Co., Essen. By 1963, two new plants will be erected at Karlsruhe at the terminal of the Marseilles pipeline. One of these will be built by Esso, and the other by a joint interest in which Deutsche Erdoel AG, Gelsenberg Benzin AG, Mobil Oil AG, Wintershall AG, and Scholven-Chemie AG will participate.

In the first nine months of 1959 West German refinery production was 15.4 million tons of finished products, while consumption in the same period (excluding bunkers) was 16.9 million tons. The demand especially for fuel oil, motor gasoline, diesel oil, and bitumen is growing steadily. For 1960, total consumption of 25.2 million tons of finished products can be foreseen.

Refining History: Until 1939, Germany had only a very small crude-oil refining capacity, since most of its oil needs were met by imports of finished and semi-finished products and by the output of the country's 27 hydrogenation and synthetic-gasoline plants which used coal as their raw material. Thus, of Germany's 18 oil refineries at the beginning of World War II, only two were equipped to process crude oil. The others were all based on the further processing of imported petroleum products.

During the war most of the oil processing plants were heavily damaged, while the bulk of the hydrogenation and synthetic plants were lost at the end of the war due to their location in the Soviet occupation zone. In the postwar reconstruction period, it was decided for two reasons to build the German oil industry up on a crude-oil refining basis rather than on the previously existing pattern. One reason was that all synthetic-gasoline production was outlawed by the allies in the first five postwar years so that domestic coal could no longer be used as the basic raw material for the production of oil products. The other reason was that the importation of finished or half-finished petroleum products meant a considerable higher outlay of foreign currency than the importation of crude oil.

GERMANY (WEST)—Refineries

Plant	Location	Crude Capacity (Barrels Per Day)	Type Plant	Cracking Capacity
Badische Anilin & Soda-Fabrik AG.	Ludwigshafen-Oppau	1,000*		
BP Benzin und Petroleum AG	Hamburg-Finkenwerder	42,000	SCA	4,500 T
Deutsche Erdoel AG	Heide	32,000	Comp.	7,700 C
	Wietze	800	S	—
Deutsche Shell AG	Hamburg-Harburg	60,000	Comp.	11,700 C
	Monheim	5,500	SAL	—
Esso AG	Hamburg-Harburg	54,000	Comp.	11,500 C
	Cologne	72,000	SCH	4,200 T
Gelsenberg Benzin AG	Gelsenkirchen-Horst	95,000	SCH	9,700 C
Gewerkschaft Deurag-Nerag	Misburg	19,000	Comp.	6,400 T, 2,600 C
Gewerkschaft Erdoel-Raffinerie Emsland	Lingen	53,000	SC	18,200 C
Kleinholz & Co.	Essen-Altenessen	2,500	S	—
Mineraloel- und Asphaltwerke AG (MAWAG)	Ostermoor	3,800	SA	—
Mineraloelwerke Albert Sengewald	Dedenhausen	900*		
Mineralotelwerke Peine	Peine	400	S	—
Mobil Oil AG in Deutschland	Bremen-Oslebshausen	32,000	Comp.	7,400 C
Oelwerke Julius Schindler GmbH	Hamburg-Neuhof	4,700	SLA	—
Purfina Mineraloeraffinerie AG	Duisburg-Neuenkampf	21,000	S	—
Ruhrbau Mineraloelraffinerie GmbH	Muelheim	6,400	SA	—
Ruhrchemie AG	Oberhausen-Holten	8,500	SC	3,400 C
Ruhroel GmbH	Bottrop-Welheim	2,600*		
Scholven-Chemie AG	Gelsenkirchen-Buer	4,200	SCH	5,100 C
Union Rheinische Braunkohlen Kraftstoff AG	Wesseling	64,000	SCH	11,700 T
Wintershall AG	Salzbergen	2,400	SL	—
Zeller & Gmelin	Eislingen/Fils	170*		

*Not operating. S—Skimming. C—Cracking. A—Asphalt. Comp.—Complete. L—Lubricating. H—Hydrogenation. Under Cracking to denote type: T—Thermal. C—Catalytic.

The first step in this direction was the reconstruction of the prewar crude-oil refineries which had been reduced by military action to a capacity of one million tons from the former 2.1 million tons. The first major step was the rebuilding of Esso's Hamburg refinery which went onstream in 1947. In 1948, the hydrogenation works at Gelsenberg and Wesseling were started up again, using crude oil instead of coal as raw material. Originally they had produced only gasoline, thereby helping to overcome Germany's lack of cracking units. Later, however, they were expanded into full-scale oil refineries. Next, BP's destroyed Hamburg plant was again put onstream in 1949. Shell's Hamburg-Harburg refinery went back onstream in the same year, as did Socony Mobil's two plants. At the same time, the various German-owned refineries, running mostly on domestic crude, were also rebuilt, although a certain delay took place because of the uncertainty, until 1950, whether or not these plants would be dismantled under the allied reparations program. As it turned out, they were not, and they remained in Germany.

Thus, the basic refinery construction program was completed in 1950, when the total refinery capacity of 3.2 million tons was only slightly below the country's total consumption of oil products. The existing gap was made up by the domestic production of shale oil, coal-based benzol and coal-tar oil, and by oil-products imports. The gap between refinery capacity and total oil requirements was closed in 1953. Since then, the German refining industry has been characterized by excess capacity. However, refinery output has continued to lag somewhat behind demand, so that Germany has remained a net importer of oil products. The main import item (aside from crude oil) is fuel oil, since the country's consumptoon of this product has been growing at such a rapid rate in the past seven years that German refineries were unable to keep pace with it. Thus while in 1952 fuel oil accounted for only 8.5% of total consumption, by 1958 it had risen to 42%, which gave it the top rank among the country's oil products.

Refinery capacity has continued to grow at a very rapid pace since 1950. At the beginning of 1959, it amounted to nearly 27 million tons

(*Continued on page 224*)

GERMANY (WEST)—Refinery Output of Finished Products (Tons)

	1957		1958	
LP-Gas	366,050		434,937	
Motor gasoline	3,148,676		3,711,904	
SBP spirit	166,124	3,680,850	169,400	4,316,241
Kerosine	39,689		41,928	
Power kerosine	1,411		677	
Jet fuel	60,944	102,044	152,928	195,533
Diesel oil		3,176,877		3,792,277
Lubricating oil		369,191		396,718
Fuel oil		2,720,637		4,349,741
Bitumen		745,733		891,259
Other products		754,878		854,436
		11,550,210		14,796,205

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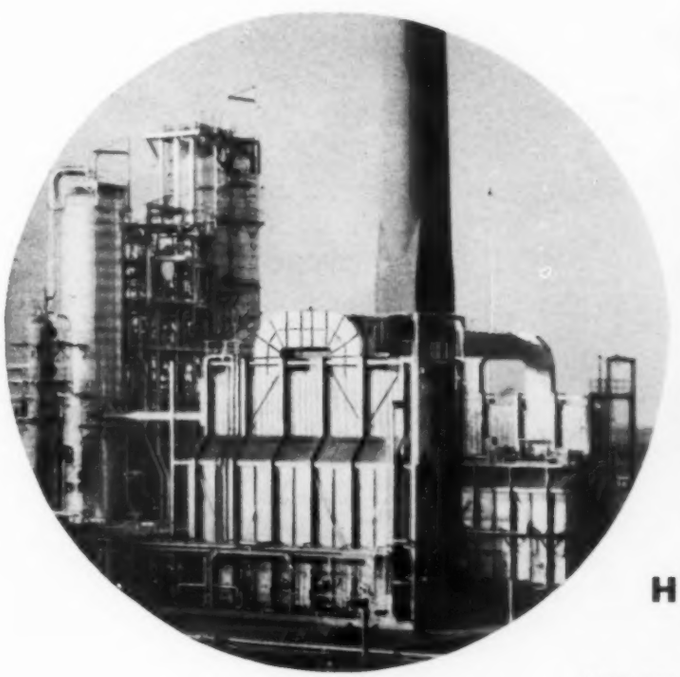

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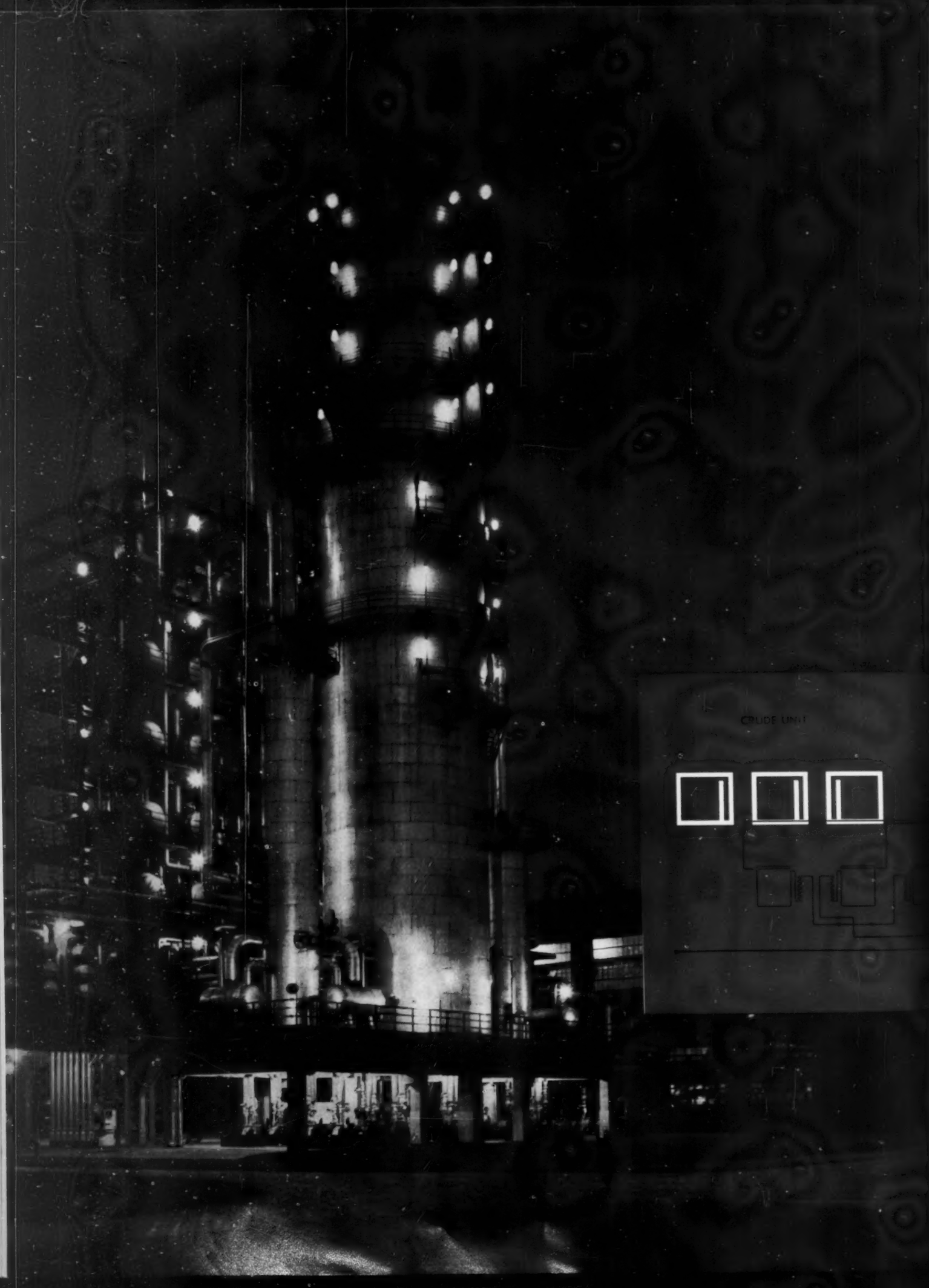
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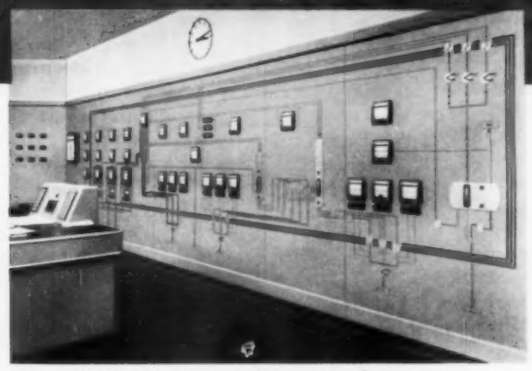

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GERMANY (WEST)—Oil Processing Capacity According to Geographic Distribution
(Thousands of Metric Tons)

	1/1/39*	1/1/51	1/1/54	1/1/57	1/1/59
GERMAN SEA PORTS:					
Hamburg					
Shell-Harburg		490	700	900	2,800
Esso-Harburg		700	1,850	2,350	2,540
BP-Finkenwerder		600	740	1,500	2,000
Schindler		200	200	200	220
Mawag-Ostermoor		60	80	130	180
	1,555	2,050	3,570	5,080	7,740
Bremen					
Mobil Oil-Oslebshausen		600	700	770	1,500
Rhine-Ruhr Area					
Shell-Monheim		200	200	220	260
Ruhrcheime-Oberhausen		250	280	280	400
Ruhrbau-Muelheim		100	300	300	300
Kraftstoffhandels Ges.-Essen		35	80	80	—
Union-Wesseling†		800	1,300	1,300	3,000
Gelsenberg Benzin-Gelsenkirchen†		700	1,300	3,000	4,500
Scholven Chemie-Ruert			400	1,000	2,000
Ruhroel-Bottrop†			120	120	120
Esso, Cologne					3,400
	275	2,085	3,980	6,300	13,980
OIL-PRODUCING AREAS:					
Schleswig-Holstein					
DEA—Heide		120	580	780	1,500
Emsland					
Emsland Refinery, Lingen			500	750	1,000
Wintershall, Salzbergen		70	90	105	115
	36	170	590	855	1,115
Hannover					
Deurag-Nerag, Misburg		528	530	760	900
Deutsche Gasolin, Dollbergen		120	120	120	121
DEA, Wietze		70	70	70	40
Sengenwald, Dedenhausen		25	42	42	42
Mineraloelwerke, Peine		20	18	18	18
Gew. Grieff, Dollbergen		6	24	24	—
	480	769	804	1,034	1,121
Baden					
BASF—Ludwigshafen		48	48	48	48
Zeller & Gmellin, Eislingen		8	8	8	8
	0	56	56	56	56
Grand Total, All Areas	2,446	5,750	10,280	14,875	27,012

*Area totals only.
†Former coal hydrogenation works.

(540,000 b/d), and by 1961 it will be at least 40 million tons (800,000 b/d), according to current plans. The increase reflects the sharp rise in German oil consumption, which jumped from less than five million tons (100,000 b/d) in 1950 to nearly 24 million tons (480,000 b/d) in 1959.

In examining the geographic distribution of the German refineries, the most important aspect is the postwar shift from the North Sea ports to the Rhine-Ruhr area. There are several reasons for this development: (1) All coal-based hydrogenation and synthetic-oil plants in the Ruhr area were converted to a crude-oil basin after the war for the economic and political reasons discussed above. (2) Hamburg lost much of its natural hinterland as a result of the partition of Germany which put this port somewhat on the periphery of the country while at the same time making it possible to supply four-fifths of postwar Germany via the Rhine River which now replaced the Elbe as the main commercial waterway. (3) With the rapid growth of fuel-oil use by industry, the Ruhr emerged as the country's major consuming area in the postwar period. (4) Since both Hamburg and Bremen are river ports, located a good distance inland from the sea, their ports cannot be sufficiently expanded to permit the supertankers of the future to dock there. Hence, the Rhine-Ruhr area has now become Germany's major refinery center, accounting already for 52% of Germany's total refining capacity. However, the big development is yet to come, with Shell, BP, and Petrofina all building plants in that area with an aggregate crude-oil processing capacity of nearly 10 million tons (200,000 b/d). All of these plants are expected to go onstream during 1960. Another new refinery center is planned at Karlsruhe on the upper Rhine. Two refineries, one by Esso and the other by DEA, will be built there within the next two years. Their combined capacity will amount to five to six million tons (100,000 b/d to 120,000 b/d).

West Germany is now experiencing its second postwar expansion period in petroleum refining. The main target now is to build high-efficiency fuel-oil producing plants. After the first period, total crude intake capacity stagnated, or increased but slightly, after 1955. In 1958, a 62.8% increase to 27 million tons annually (about 540,000 b/d) marked the beginning of the second postwar expansion period.

Within the next two years, completion of three new fuel-oil refineries will result in a further large increase in refining capacity. In the summer of 1959, Purfina Mineraloelraffinerie AG's palnt at Dunisburg-Neuenkampf went onstream with an initial annual capacity of about one million tons (about 20,000 b/d) of crude. In 1960, completion of the Godorf (near Cologne) fuel-oil refinery of Deutsche Shell AG is anticipated. Initial capacity will be four million tons (about 80,000 b/d) of crude.

On the northwestern edge of the Ruhr area near Dinslaken, BP Benzin and Petroleum AG, affiliate of British Petroleum Co., is building a fuel-oil refinery with a potential annual processing capacity of four million tons (80,000 b/d) of crude. This also will be completed in mid-1960. Recently some details on the processing facilities of BP were published. Crude from Iran, Iraq, and Kuwait is to be refined at Dinslaken. Two distillation units, each with a daily capacity of 7,000 tons, are being built. A catalytic reformer (throughput 500,000 tons annually) is to improve the quality of the raw gasoline. A Hydrofiner for desulfurizing gas oil is being designed for an annual throughput of 450,000 tons. Recovery is to be 3% propane-butane; 10% to 15% motor gasoline; 8% to 12% light gasoline for the petrochemical industry; 4% to 6% kerosine; 15% to 26% diesel oil and light fuel oil, respectively; 40% heavy fuel oil; and 5% refinery gas, the works' own consumption and losses.

With support from the provincial government and Aminoil, it is likely Gottlieb Duttweiler (Swiss) will be able to proceed with the refinery project at Emden harbor (North Sea Coast). This plant, to be completed in 1961, is to have an annual crude capacity of 1.5 million tons (30,000 b/d).

Up to now, the southern part of the federal republic, viz., the provinces of Bavaria, Baden-Wuerttemberg, Rhineland Palatium, and Hesse, have been supplied principally with petroleum products from the North Germany refineries; and, in the case of direct imports, from the North Sea harbors. Some motor fuels and fuel oil have come also from Italy, Austria, and some countries in the Soviet bloc. Indigenous crude production cannot keep pace with the rapid rise in demand and refinery output. As a consequence, the percentage of German crude in total refinery throughput declined to 29.2% in 1958 from 23.7% in 1957. The processing program of the Arbeitsgemeinschaft Erdoelgewinning und Verabeitung (AEV) anticipated an annual intake of 4.7 million tons (94,000 b/d) of German crude, 11.7 million tons (234,000 b/d) of Middle East crude, and five million tons (100,000 b/d) of Venezuelan crude for 1959.

Petrochemical Development: Despite extensive war damage, the German petrochemical industry has grown rapidly, converting from coal to the use of oil as a base material and thus meeting competition from international sources successfully. Development has proceeded so rapidly that today the Federal Republic of Germany stands first, after England, in Europe. The development was promoted by the boom in motorization and oil processing. Also, because the cost of coal rose 300% and electric power 200%, the scarcity of these two energy sources led eventually to a shortage in carbide.

Petrochemistry comes into play when by-products of oil cracking are used as raw material for chemicals. Therefore, today it is impossible to draw a sharp difference between the chemical and crude-oil refining industries. In Germany there naturally arose, in addition to dual-purpose plants, strictly petrochemical processes by means of which the production of chemicals from crude oil and natural gas is the

(Continued on page 230)

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Hydrocarbon Mineralöl G.m.b.H. (abbreviated Hydromin), Düsseldorf, Fürstenwall 23, Germany, is an engineering office and was founded in 1950 by the two parent companies, Hugo Stinnes Industrie und Handel G.m.b.H. and Hydrocarbon Research, Inc., New York. The purpose of Hydromin is the planning, construction, erection and initial operation of units in the petroleum industry in close collaboration with Hydrocarbon Research Inc. Hydrocarbon Research makes available process design and the newest developments in modern refinery technology, which serve as a basis for further engineering planning.

Hydromin has at its disposal a staff of competent technical and business personnel, so that it is in position to plan and deliver on schedule turn-key jobs for both complete refineries and for refining units. Well trained and experienced engineers and technicians make up the various departments, such as: construction offices for vessels and condensers; pipelines; pumps and compressors; industrial furnaces; measurement and electro technology, etc. Special departments for purchasing, scheduling and acceptance, serve to prepare construction in such a way that it can proceed without interruptions or delays. Experienced engineers with the necessary knowledge of languages are available for supervision of construction and for start-up operations.

Among the many units erected since 1950, the following are mentioned:

New refinery for the Greek Government in Aspropyrgos/Athens

Large refinery in Cubatao, Brazil, for Conselho Nacional Do Petrole, Rio de Janeiro

Catalytic cracking units in—Heide/Holstein for Deutsche Erdöl A.G., Hamburg

Donges, France, for Raffineries Francaises de Petrole de l'Atlantique and Atlantique Progil Electrochimie

Petitjean, Rabat, Morocco for Société Cherifienne des Pétroles

Gelsenkirchen for Gelsenberg Benzin A.G. Gelsenkirchen, Germany

Cabo Ruivo, Portugal, for Sociedade Anonima Concessionaria da Refinacao de Petroleos em Portugal "Sacor", Lisbon

Units for the reforming of naphthas, thermal cracking, polymerization, desalting, etc. were built for—

Union Rheinische Braunkohlen Kraftstoff A.G., Wesseling near Cologne, Germany

Socony Vacuum Francaise, Paris, France

Raffineries Francaises de Pétrole de l'Atlantique, Paris and Atlantique Progil Electrochimie, Donges, France

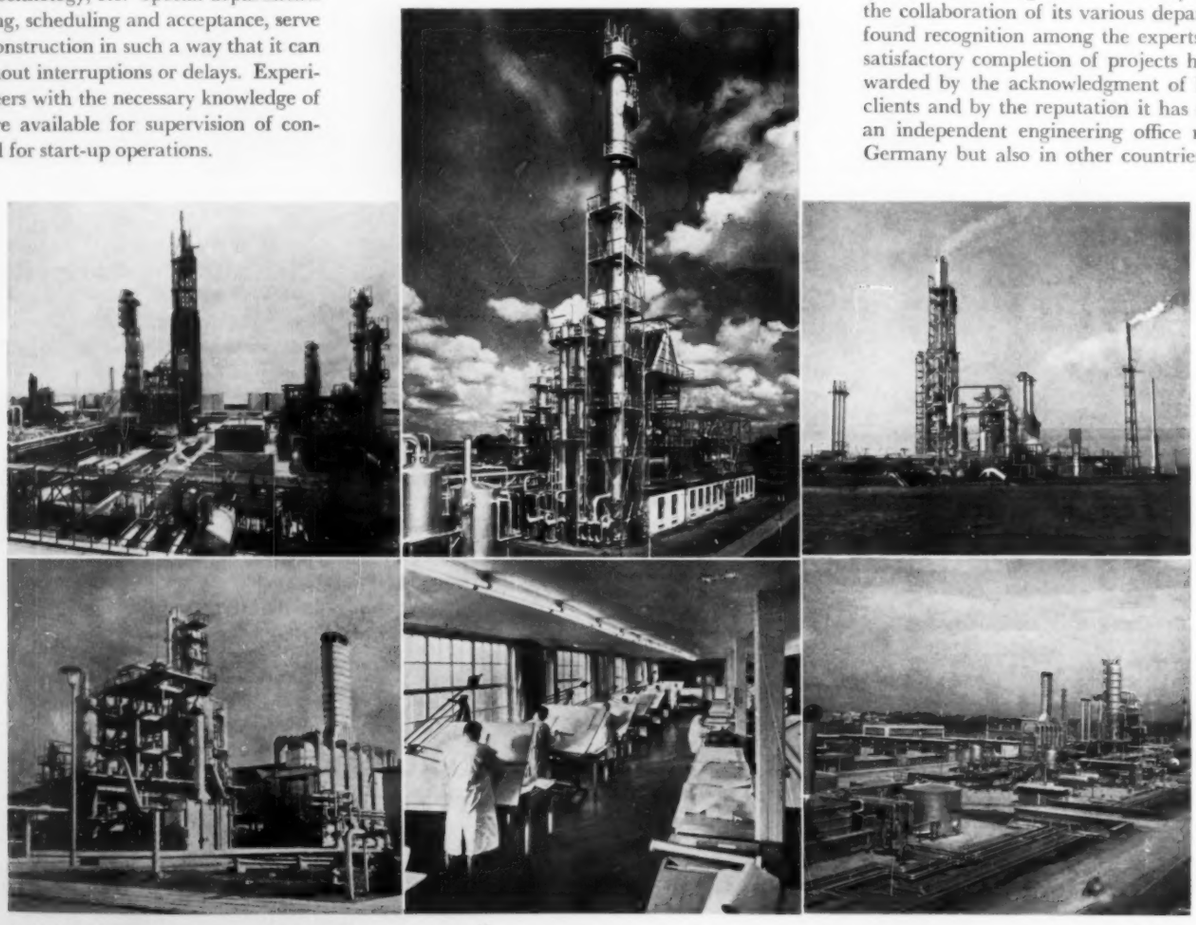
Sociedade Anonima Concessionaria de Refinacao de Petroleos em Portugal "Sacor", Lisbon, in Cabo Ruivo

Mobil Oil A.G., Celle, Germany

Gewerkschaft Deutsche Erdölraffinerie, Misburg, Germany

With the increasing importance of petroleum technology, the working area of Hydromin has been enlarged and extended to petrochemical units, for instance for the production of ammonia, ethylene, oxygen, nitrogen and rare gases. In close collaboration with clients problems have also been solved in the field of solvent and detergent preparation, and units have been erected. The diversified nature of the engineering staff permits the undertaking of jobs such as development of road building and transportation machinery and processing in the nuclear energy field.

The careful organization of Hydromin and the collaboration of its various departments has found recognition among the experts. Fast and satisfactory completion of projects has been rewarded by the acknowledgment of Hydromin's clients and by the reputation it has acquired as an independent engineering office not only in Germany but also in other countries.



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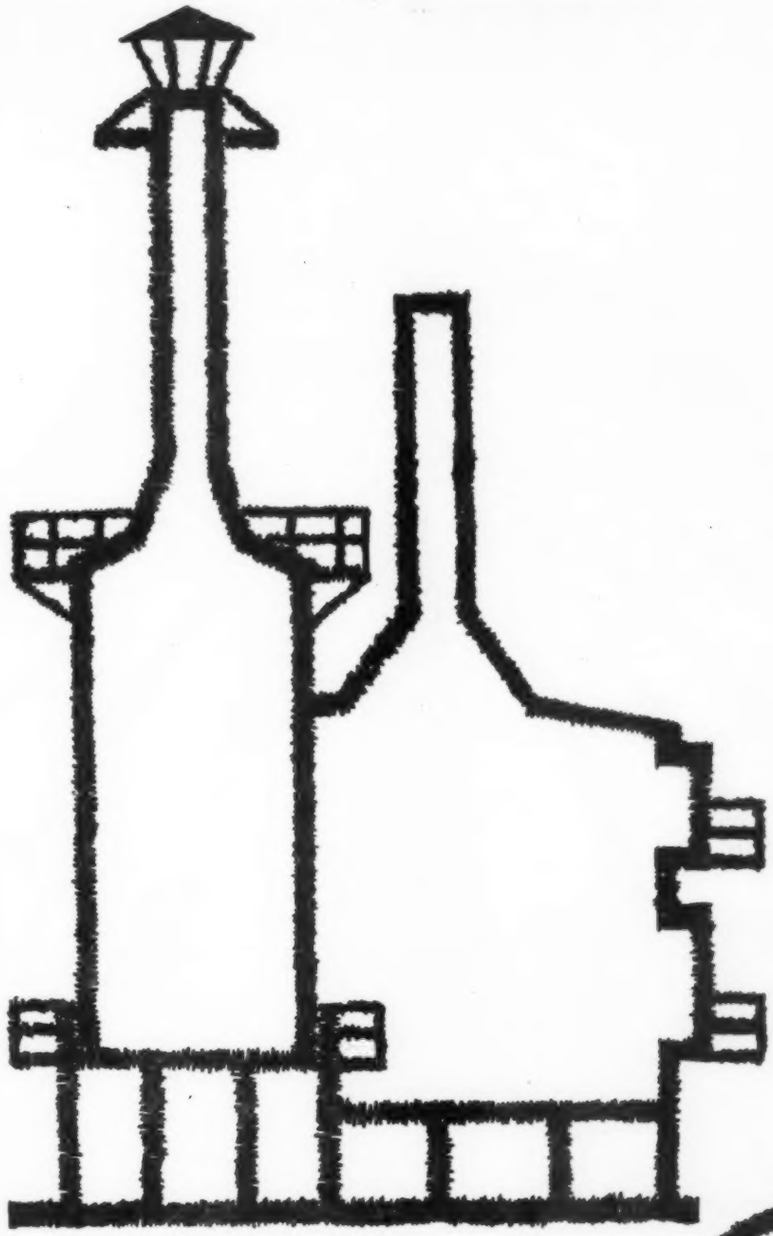

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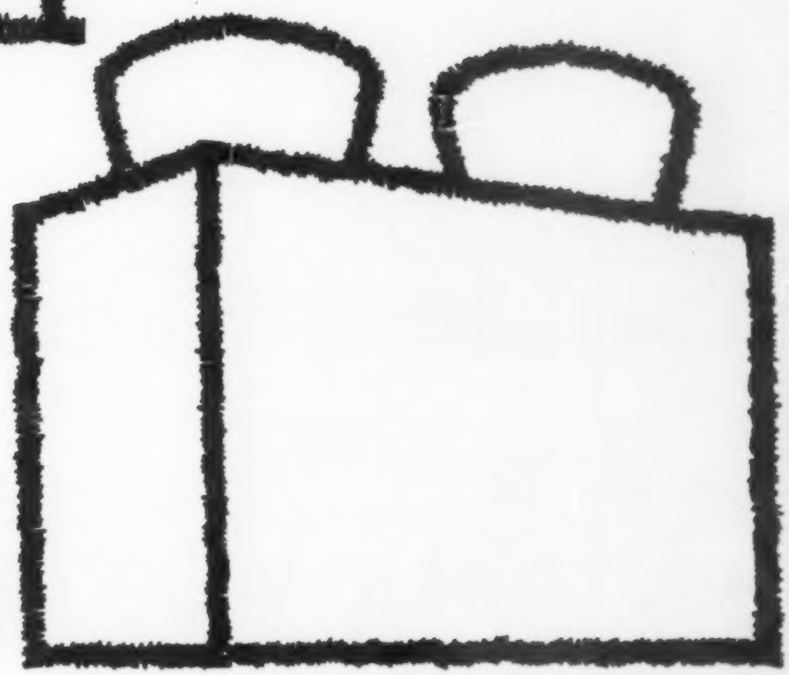

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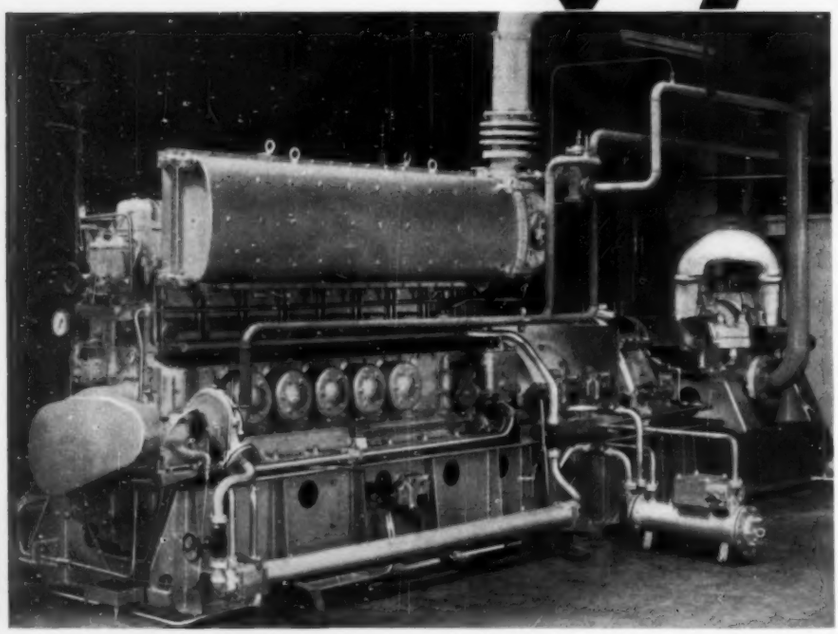

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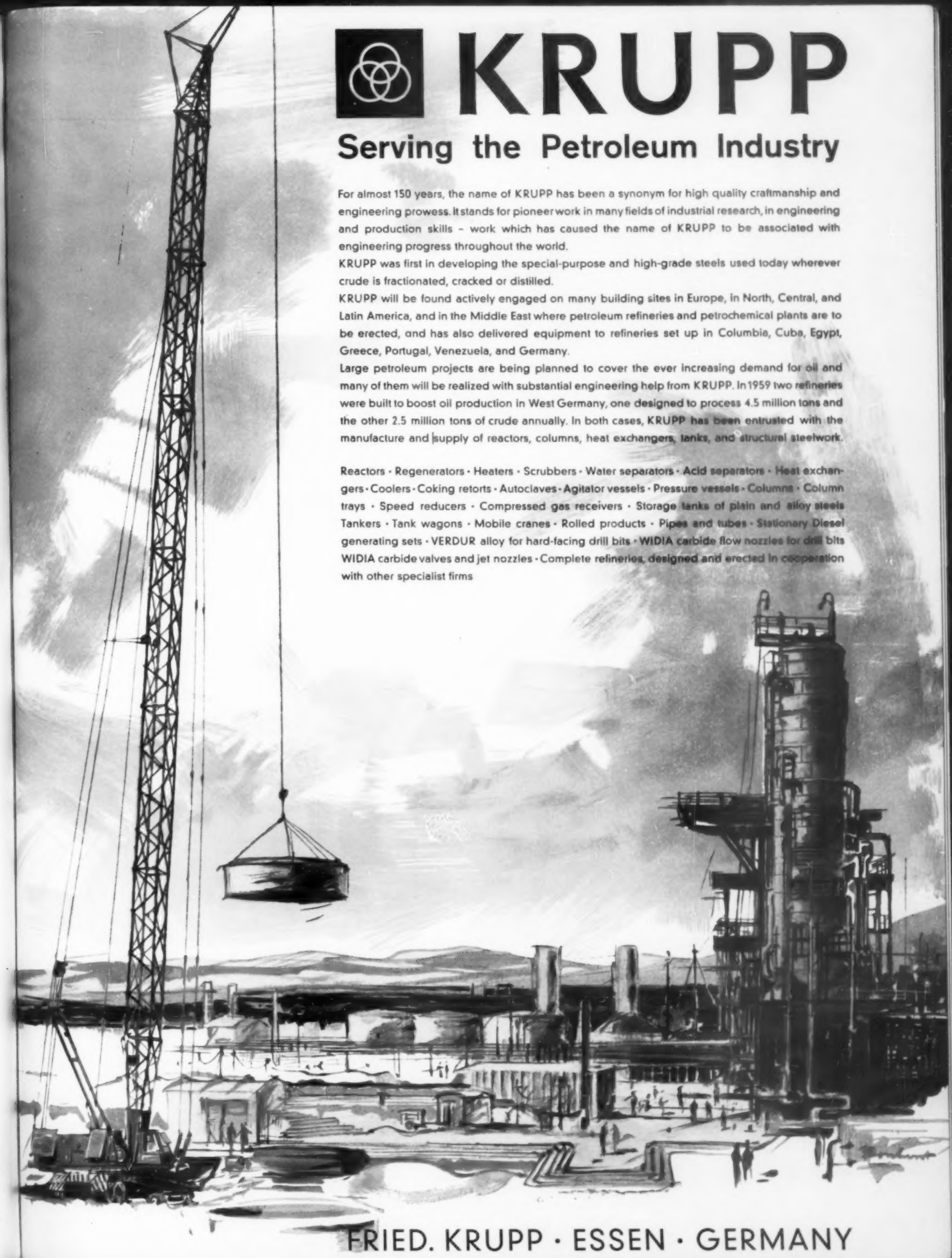

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KRUPP was first in developing the special-purpose and high-grade steels used today wherever crude is fractionated, cracked or distilled.

KRUPP will be found actively engaged on many building sites in Europe, in North, Central, and Latin America, and in the Middle East where petroleum refineries and petrochemical plants are to be erected, and has also delivered equipment to refineries set up in Columbia, Cuba, Egypt, Greece, Portugal, Venezuela, and Germany.

Large petroleum projects are being planned to cover the ever increasing demand for oil and many of them will be realized with substantial engineering help from KRUPP. In 1959 two refineries were built to boost oil production in West Germany, one designed to process 4.5 million tons and the other 2.5 million tons of crude annually. In both cases, KRUPP has been entrusted with the manufacture and supply of reactors, columns, heat exchangers, tanks, and structural steelwork.

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exclusive purpose. The following petrochemical operations are important for federal Germany: (1) production of olefins; (2) production of synthetic gas to manufacture ammonia, methanol, and its byproducts (hydrogen from natural gas, crude oil, cracking and benzene fractions); (3) conversion of methane.

The petrochemical production of the federal republic from 1953 until 1957 tripled. Of the total petrochemical production of West Europe, Germany's output was nearly 27%. In 1960, German production will be more than double. This production increase will not be so large as in France where, combined with the great natural-gas reserves in Lacq, production is expected to be four times as high. Great Britain, previously the largest producer, will produce a somewhat smaller share, as may be seen in the accompanying table on petrochemical production in Western Europe.

Germany's share of the total organic petrochemical production will increase greatly until 1960; but, considering conditions, it will never be possible to attain America's level. This is demonstrated by the figures of primary products converted to organic byproducts in the USA, Germany, and France.

The relatively small role played by acetylene chemistry in the USA is recognized at once, but also the noticeable fact that it has developed more than in West Germany and in France, where it grew little, or not at all. In the USA, acetylene chemistry has held its pace with general development in the organic sector, but lost ground in both European countries to other aliphatic branches. For easier global conception of the accompanying petrochemical table, actual quantities of intermediate chemicals are shown in metric tons—as is usual with OEEC in the sphere of petrochemical production.

The preponderance of aliphatic chemistry in the USA is outstanding as compared with aromatic (eliminating the C_1-column in the table), while these two sections in West Germany and in France are about equal. In 1950, the difference between these aromatics (800,000 tons C) and the C_2/C_3 column (900,000 tons C) were also relatively low. The Federal Republic of Germany still exceeded this aromatic column (about 130,000 tons C).

In a few years nearly a billion DM has been invested in the petrochemical industry. Future development is expected to move in various directions. Of most immediate importance is plastics because of the great variety of new items produced by the chemical industry for daily life.

It is very probable that many older production processes—for instance, tar dyestuffs and pharmaceuticals, both primary and intermediate products, which are the result of pioneer inventions, will be influenced by new petrochemical developments.

The postwar plants of "Phenol Chemie GmbH" in Zweckel, where phenol is produced from petrochemical propylene, and coal-tar benzene are examples of this trend. Another characteristic example is the transfer of results of petrochemistry to the ammonia synthesis, which was originally developed from coal chemistry. Lately at BASF, as at Hoechst, considerable quantities of ammonia for fertilizers have been obtained from petrochemical raw materials.

GERMANY (WEST)—Annual Crude Capacity of Refineries

Company	Plant Location	Crude Capacity (Thousands of Tons) Dec. 31, 1957	Dec. 31, 1958
Badische Anilin- und Sodafabrik AG	Ludwigshafen[1]	48	48
BP Benzin und Petroleum AG	Hamburg-Finkenwerder	1,900	2,000
(British Petroleum Co. Ltd.)	Dinslaken[2]	—	—
Deutsche Erdoel-AG	Heide	810	1,500
	Wietze	40	40
Deutsch Shell AG	Hamburg-Harburg	900	2,800
	Manheim	260	260
	Godorf[3]	—	—
Esso AG	Hamburg-Harburg	2,520	2,540
	Cologne	—	3,400
Gelsenberg Benzin AG	Gelsenkirchen	3,300	4,500
Gewerkschaft Deurag-Nerag	Misburg near Hannover	800	900
Gewerkschaft Erdoel-Raffinerie Emsland	Lingen in Emsland	800	1,000
Gewerkschaft Greiff Bergbau	Dollbergen	24	—
Kraftstoff-Handelsgesellschaft mbH	Essen	80	121
Mineraloel- und Asphaltwerke AG (Mawag)	Ostermoor on Kiel Canal	150	180
Mineraloelwerke Peine (Schindler)	Peine (Hannover)	18	18
Mineraloelwerke Albert Sengewald	Dedenhausen	42	42
Mobil Oil AG in Deutschland	Bremen-Oslebshausen	770	1,500
Oelwerke Julius Schindler GmbH (BP)	Hamburg-Neuhof	220	220
Purfina Mineraloelraffinerie AG	Duisburg[4]	—	—
Ruhrbau Mineraloelraffinerie GmbH	Muelheim on Ruhr	300	300
Ruhrchemie AG	Oberhausen-Holten	375	400
Ruhroel, Chemiewerk der Steinkohlenbergwerke Mathias Stinnes AG	Bottrop	120	120
Schloven-Chemie AG	Gelsenkirchen-Buer	1,000	2,000
Union Rheinische Braunkohlen Kraftstoff AG	Wesseling near Cologne	2,000	3,000
Wintershall AG	Salzbergen in Emsland	105	115
Zeller & Gmelin	Eislingen in Wuertemberg	8	8
		16,590	27,012

[1] Shut down.
[2] BP is building a 4-million-ton refinery.
[3] Shell is building a 4-million-ton refinery.
[4] Purfina is building a 1-million-ton refinery.

TRANSPORTATION: The pipeline from the new oil harbor of Wilhelmshaven to the Rhine-Ruhr area (total length 242 miles) has been in operation since November 1958. The pipeline from Rotterdam to Godorf-Wesseling (Cologne district), which has a total length of 183 miles, is now nearing completion. From Wilhelmshaven, about six million tons of crude oil were pumped to the south in 1959.

A plan has been announced by the Italian State company ENI to build a pipeline from Genoa via Aigle to Munich, but now it seems rather doubtful whether this project will be carried out. The next inter-European pipeline to be built will be that from Lavéra near Marseilles to Strasbourg and Karlsruhe, in which practically all leading oil companies participate. This pipeline is to have a total length of 460 miles, and will be completed in 1963.

Tankers: Tankers under the German flag constitute 1.4% of the world's tanker fleet. On July 1, 1958, there were under the flag of the federal republic a total of about four million BRT registered tons; of these, 104 units with 475,000 BRT, i.e., about 12%, were tankers, including three ore-oil tankers.

Within the German tanker fleet are included 24 units with about 340,000 BRT; they are in the class of over 10,000 BRT. These ships are being used for the transport of overseas crude oil to the federal republic. The remaining 80 tankers are mainly used for the transport of crude oil and finished products in coastal traffic.

Present plans contemplate increasing the tanker fleet by an additional tonnage of about 800,000 BRT before 1963. Making allowance for the scrapping of old tonnage (about 200,000 BRT), this will bring the German tankship registry up to about 1.1 million BRT by the year 1963. Future additions to the tanker fleet will be in the form of supertankers with capacities of 26,000 tons or more.

Pipelines: Until the beginning of 1959, pipelines played only a very minor role in German oil transportation. Products lines were (and still are) only of local significance, their total length amounting to only about 100 miles. The same applied to crude oil lines, since most refineries are located either at North Sea ports or at the Rhine River. However, with the recent growth of Rhine River refineries, barge traffic on the Rhine was no longer adequate to meet demand. Hence, Germany's first major crude-oil pipeline was constructed in 1958. It extends from Wilhelmshaven on the North Sea to the Cologne area, and has an initial capacity of 10 million tons (200,000 b/d). The pipeline became operative at the beginning of 1959. It has caused a sharp decline in oil imports at Hamburg, which in 1958 still accounted for 54% of

GERMANY (WEST)—Tanker Fleet on the Rhine
(As of January 1, 1957)

Country	Motor Ships Number	Motor Ships Capacity	Barges Number	Barges Capacity, Tons
German Federal Republic	119	79,393	37	32,635
Netherlands	154	112,292	103	121,620
Belgium	8	5,526	2	1,825
France	3	2,548	13	13,071
Switzerland	63	54,612	10	11,801
Totals	347	254,371	165	180,952

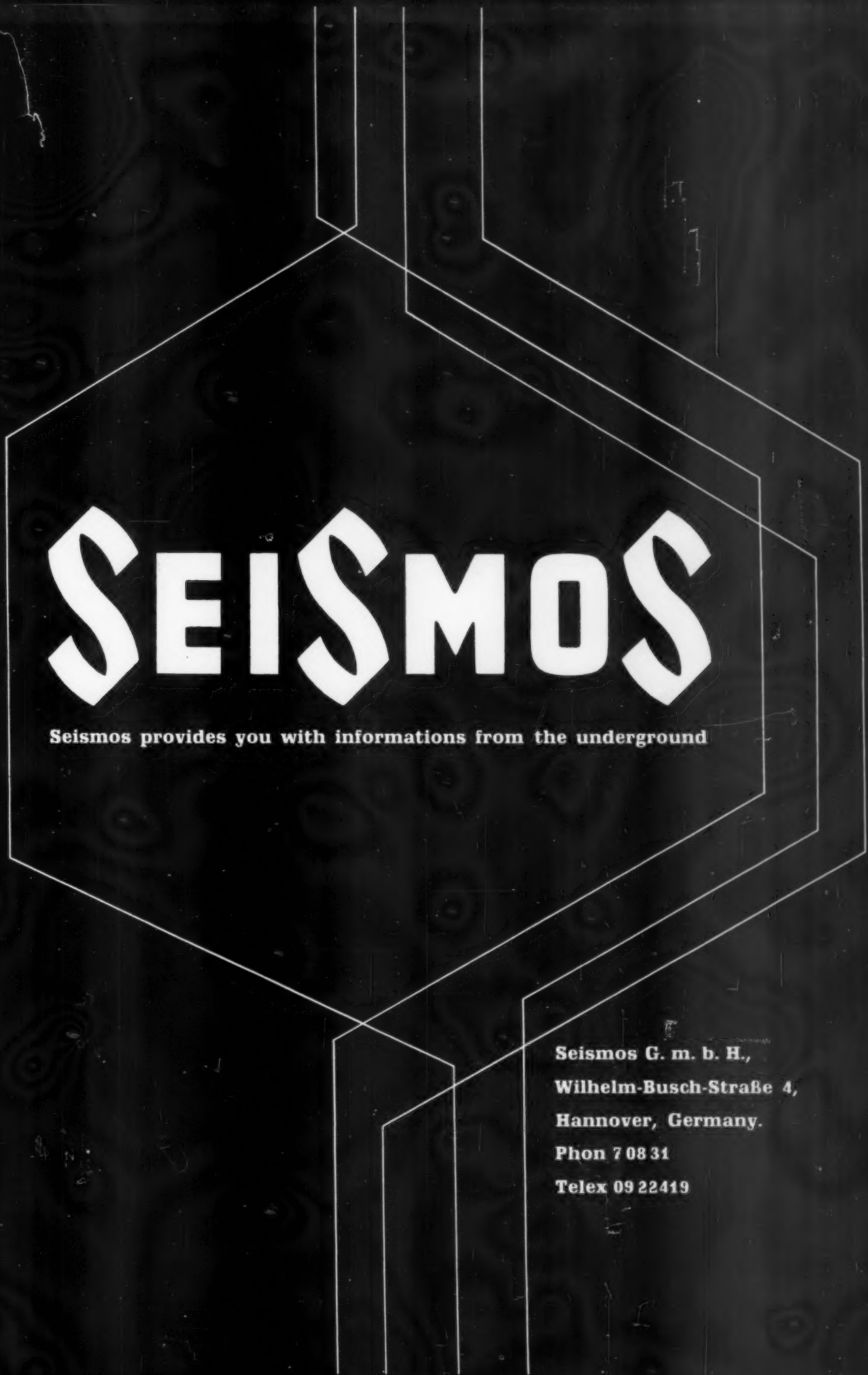
GERMANY (WEST)—Oil Consumption in the Federal Republic
(Millions of Metric Tons)

Year	1950	1951	1952	1953	1954	1955	1956	1957	1958
Total oil	5.6	5.7	6.5	7.5	9.6	12.1	15.3	16.6	19.5
Fuel oil	0.2	0.8	0.8	1.0	1.2	2.1	3.8	4.9	7.5

GERMANY (WEST)—Indigenous Oil Output and Imports by the Federal Republic
(Millions of Metric Tons)

Year	1950	1951	1952	1953	1954	1955	1956	1957	1958
Indigenous output	1.1	1.4	1.8	2.2	2.7	3.1	3.5	4.0	4.4
Imports	3.1	4.1	4.2	5.2	6.9	9.0	11.5	12.4	15.7
Total	4.2	5.5	6.0	7.4	9.6	12.1	15.0	16.4	20.1
of which fuel oil imports	—	0.1	0.1	0.1	0.4	1.2	2.4	3.1	4.4

(Continued on page 234)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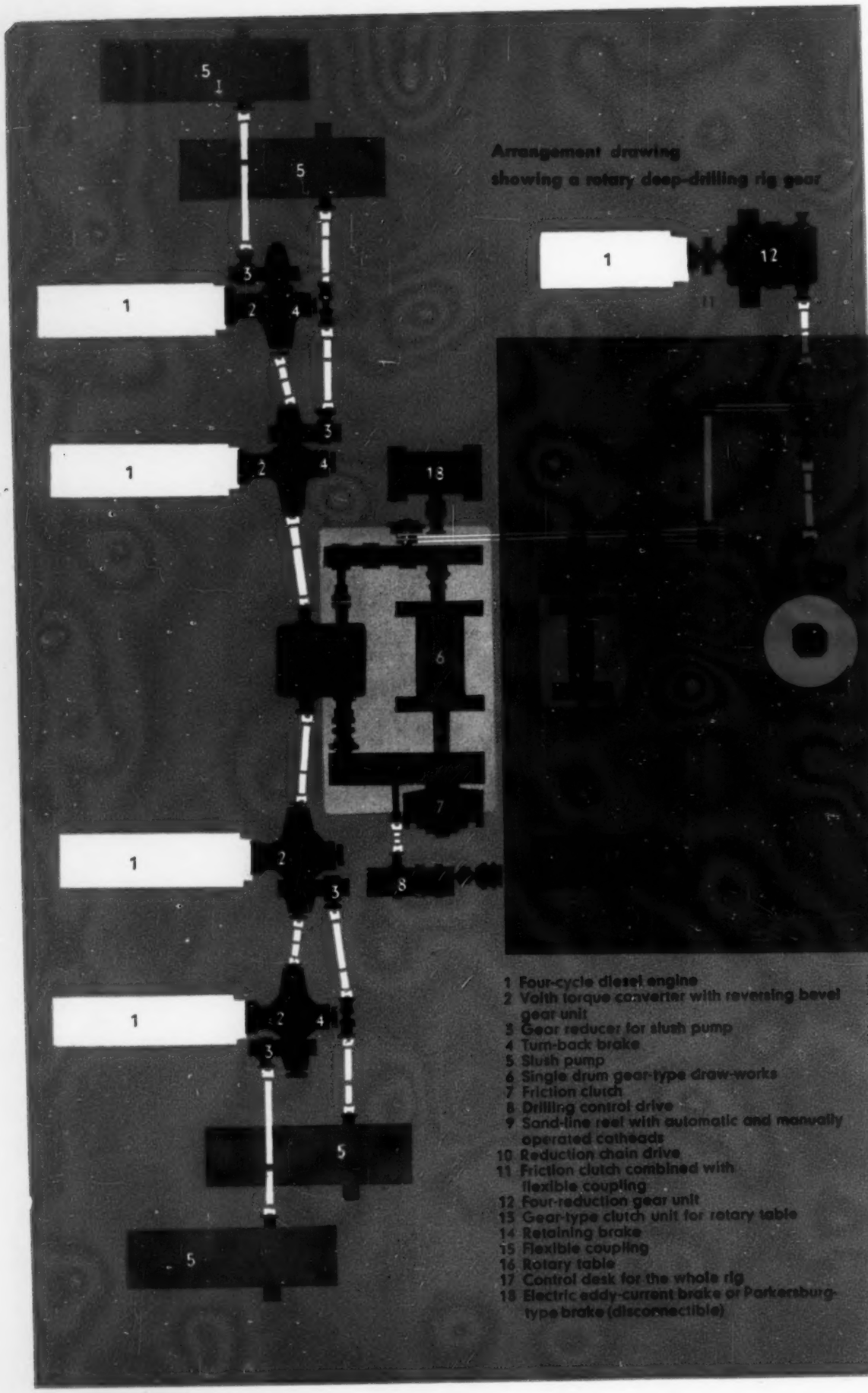

Arrangement drawing showing a rotary deep-drilling rig gear

1 Four-cycle diesel engine
2 Voith torque converter with reversing bevel gear unit
3 Gear reducer for slush pump
4 Turn-back brake
5 Slush pump
6 Single drum gear-type draw-works
7 Friction clutch
8 Drilling control drive
9 Sand-line reel with automatic and manually operated catheads
10 Reduction chain drive
11 Friction clutch combined with flexible coupling
12 Four-reduction gear unit
13 Gear-type clutch unit for rotary table
14 Retaining brake
15 Flexible coupling
16 Rotary table
17 Control desk for the whole rig
18 Electric eddy-current brake or Parkersburg-type brake (disconnectible)

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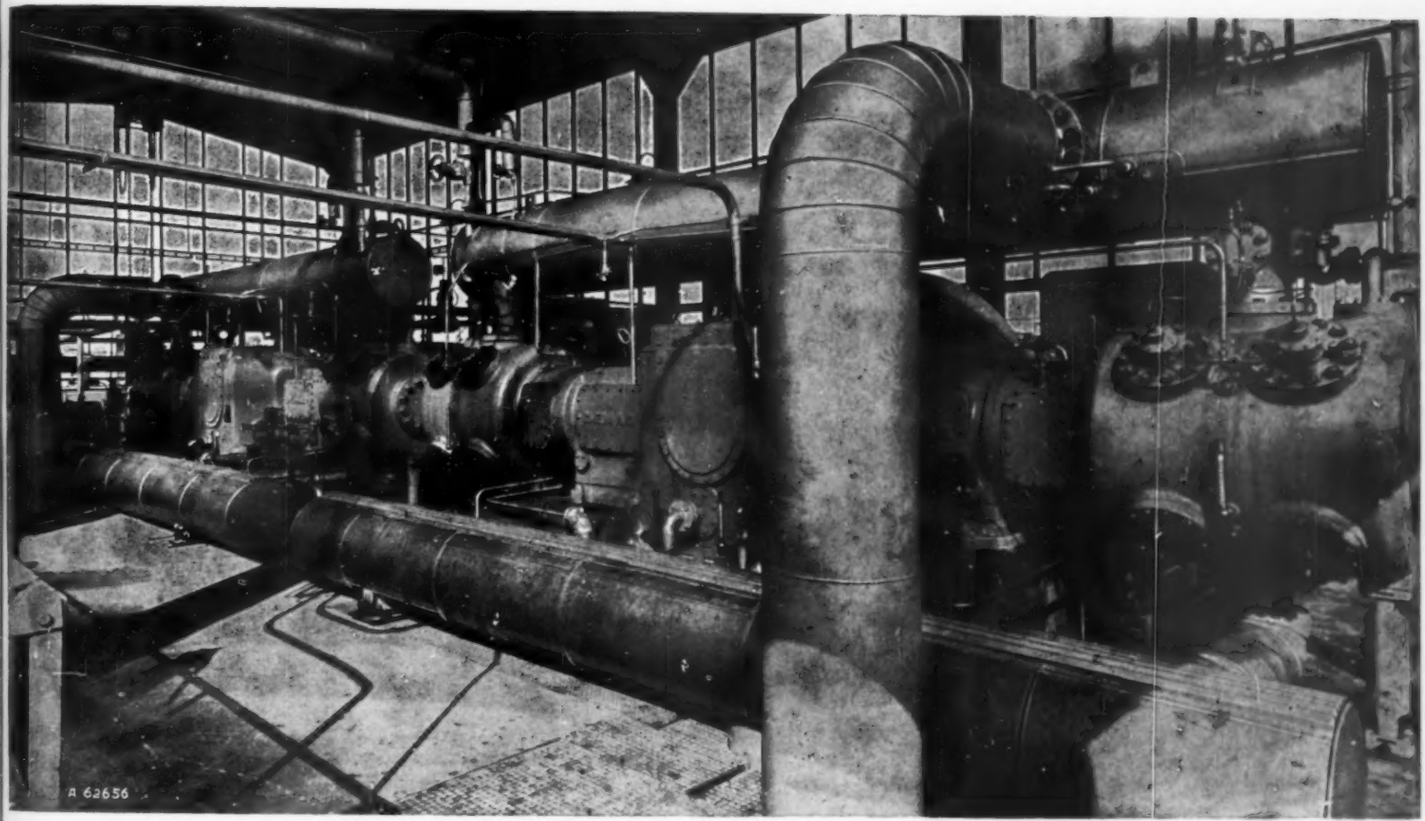

Horizontal opposed reciprocating compressor for a delivery of 37,500 scfm of hydrogen to be compressed from 295 to 490 psia

Deep-drilling rigs and compressors

Our gear-type drilling rigs for operations to a depth of 20,000 ft. have proved their value at many oilfields. They are equipped with heavy-duty gear units instead of chains, and with torque converters. They are built according to the "unit construction" principle, permitting the layout of the machinery to be varied in many different ways.

For use in oilfield and refinery operations, we supply reciprocating and turbo compressors for all kinds of gases and for all deliveries and pressures.

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DEMAG AKTIENGESELLSCHAFT DUISBURG GERMANY

GERMANY (WEST)
(in 1000 metric tons per year)

	(Actual) 1957	(Planned) 1961	1965
BASF, Ludwigshafen	48	48	48
BP AG, Hamburg	1,900	2,000	2,000
BP AG, Dinslaken	—	4,400	4,400
Deutsche Erdöl AG, Heide (Holstein)	850	1,500	1,500
Deutsche Erdöl AG, Werk Karlsruhe	—	1,500	3,500
Deutsche Shell AG, Werk Harburg	900	2,900	2,900
Deutsche Shell AG, Werk Köln	—	4,000	7,000
Deutche Shell AG, Werk Monheim	260	260	260
Erdölwerke Frisia, Emden	—	1,500	1,500
Esso AG, Werk Hamburg	2,520	3,000	3,000
Esso AG, Werk Köln	—	3,400	7,500
Gelsenberg Benzin AG, Gelsenkirchen	3,300	4,500	4,500
Gewerkschaft Erdölraffinerie DEURAG-NERAG, Miesburg	800	1,300	1,300
Gewerkschaft Erdölraffinerie Emsland, Lingen	800	2,500	2,500
Gewerkschaft Greiff Bergbau, Dolb.	24	24	24
Kraftstoff Handelsges. m.b.H., Essen	80	400	400
Mineralöl—und Asphaltwerk AG, Ostermoor	150	250	250
Mineralölwerke Peine	18	18	18
Mineralölwerke A. Sengewald, Dedenheim	42	42	42
Mobil Oil AG in Deutschland, Bremen	770	1,500	1,500
Purfina, Duisburg	—	3,000	3,000
Olwerke J. Schindler GmbH, Hamburg	220	220	220
Ruhrbau Mineralölraffinerie, Mühlheim	300	300	300
Ruhrchemie AG, Oberhausen	375	500	500
Ruhröl, Chemiewerk der Steinkohlenbergwerke Mathias Stinnes AG, Bottrob	120	120	120
Scholven Chemie AG, Gelsenkirchen	1.000	2,500	2,500
Union Rheinische Braunkohlen Kraftstoff AG, Wesseling	2.000	3,000	3,000
Wintershall AG, Salzbergen	105	105	105
Zeller & Gmelin, Minerclölraffinerie, Eislingen/Fils	8	8	8
Total	16.590	44.795	53.895

Production of Intermediates for Conversion into Organic Chemicals (in metric tons)

	1950	1954	1955	1956	1957
Germany (West)					
Carbon monoxide	85,000	240,000	270,000	—	260,000
Methane	2,000	5,000	7,000	—	13,000
Acetylene	90,000	160,000	185,000	—	185,000
Ethylene	25,000	45,000	50,000	—	70,000
Propylene	1,000	15,000	18,000	—	40,000
Benzene	45,000	120,000	145,000	—	190,000
Naphthaline	30,000	50,000	60,000	—	70,000
USA					
Methane	280,000	860,000	450,000	—	460,000
Acetylene	100,000	190,000	220,000	—	260,000
Ethylene	700,000	1,100,000	1,400,000	—	1,800,000
Propylene	300,000	550,000	600,000	—	700,000
Benezene	700,000	900,000	1,100,000	—	1,200,000
Naphthaline	180,000	170,000	270,000	—	240,000
France					
Acetylene	—	35,000	50,000	50,000	54,000
Ethylene	—	3,000	11,000	14,000	18,000
Propylene	—	17,000	26,000	30,000	33,000
Benezene	—	40,000	51,000	60,000	72,000
Naphthaline	—	26,000	35,000	27,000	24,000

Germany's total oil imports. Conversely, it has raised Wilhelmshaven to the rank of Germany's chief oil port.

In August 1958, the Ste. du Pipeline Sud-Européen was organized in Paris to lay the long-contemplated pipeline from Marseilles to the upper Rhine. In addition to the well-known international oil companies, interest in the joint project also came from some German interests, viz., Deutsche Erdoel AG, Gelsenberg Benzin AG, Mobil Oil AG (Germany), Scholven-Chemie AG, and Wintershall AG. Almost simultaneously it was announced that Deutsche Erdoel AG intended to build a fuel-oil refinery at Karlsruhe which, together with Strasbourg, may be the terminal of the Marseilles pipeline. Annual crude throughput capacity of the new refinery is to be 1.5 to 2 million tons (30,000 b/d to 40,000 b/d). It is possible that, in addition to the aforementioned companies, other German companies may participate in the Karlsruhe project.

Esso AG also is considering the purchase of a site north of Karlsruhe for expanding a new mineral-oil processing plant on the upper Rhine. Thus Karlsruhe, together with Strasbourg on the French side—where some other international oil groups intend to erect additional refineries—may become a new refining center in the heart of Europe. Beginning with 1963, when completion of the Marseilles pipeline is planned, not only southern Germany, but also the eastern parts of France and the north of Switzerland, may be supplied in the future. While Marseilles will be the import point for the crude which will be processed in Karlsruhe, the new works on the lower Rhine and the hydrogenation works and refineries in the Ruhr district are now linked with Wilhelmshaven harbor on the North Sea coast by the recently completed 242-mile pipeline, or will be supplied via the new pipeline from Rotterdam to Cologne-Wesseling now being built and to be finished in 1960.

MARKETING: Oil consumption in the federal republic has grown to 19.5 million tons from 5.6 million tons during the years 1950 to 1958. The rise is consumption of fuel oil has been most remarkable during the past few years, and is reflected in the output of the refineries and the share of fuel oil in the overall imports.

25% to 30% of German oil requirements are met from indigenous wells. In view of rapidly increasing consumption, this domestic share tends to decrease despite growing output. It is evident, therefore, that the federal republic is highly dependent on imports of mineral oil. Roughly two-thirds to three-fourths of its overall requirements must be imported.

Corresponding with the location of the two main consuming areas, oil imports of the federal republic find their way mainly via the River Elbe and the Rhine. Imports via the Elbe are by far the most important; Hamburg, therefore, has rightly been called the oil port of Germany. Since early 1959 Wilhelmshaven has stepped into the picture as a new oil port, a pipeline having been built to connect it with the Rhine-Ruhr district.

OIL LAWS*

West Germany is a federal republic consisting of the following states: Schleswig-Holstein, Hamburg, Bremen, Lower Saxony, Hessia, North Rhine-Westphalia, Rhineland-Palatine, Badenia-Wurttemberg, Bavaria.

Under the constitution, the federation and the individual states have an exclusive or so-called competitive right to legislate, under which the states may decree laws as long as the federation has not exercised its right for legislation. Regulation of petroleum exploration and exploitation falls under the so-called competitive legislation. Since the federation so far has not decreed laws in this sphere, the states may exercise their right for legislation.

The exploration and exploitation of minerals has been regulated in the territory of the former federal state of Prussia, as well as in other federal states of the former German Reich, in a number of laws, of which the General Prussian Mining Act of 1886 is the most important in view of the territorial size covered by it—the Prussian state at that time having the largest extension of all federal states. After the turn of

*This review, and the subsequent discussion of taxation, has been compiled by the law firm of Dr. W. v. Metzler and Dr. Kurt Abendroth, Alter Wall 32[III], Hamburg 11, Germany.

1957 Production of Petrolchemicals
(Figures in tons of carbon content)

	Aliphatic chemicals C_1 Carbon monoxide and methane	C_2&C_3 Acetylene Ethylene Propylene	Aromatic chemicals Benzene Naphthalene
USA	375,000[1]	2,145,000[2]	1,335,000
Federal Rep. Germany	130,000	265,000	240,000
France	—	95,000	90,000

1) Excludes carbon monoxide
2) Includes ethanol

Petrochemical production in West Europe in 1,000 ton carbon capacities

	1955	1956	1957	1958	1960*
Federal Republic	110	134	166	187	395
France	36	50	80	141	400
Italy	26	39	73	131	171
Great Britain	198	219	274	327	301
Netherlands	27	31	36.5	44.5	56
Belgium					17

*Planned.

(Continued on page 238)

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Compensating leads
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in many forms specially suited
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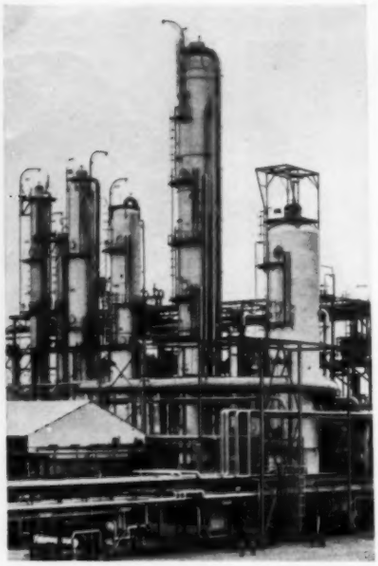
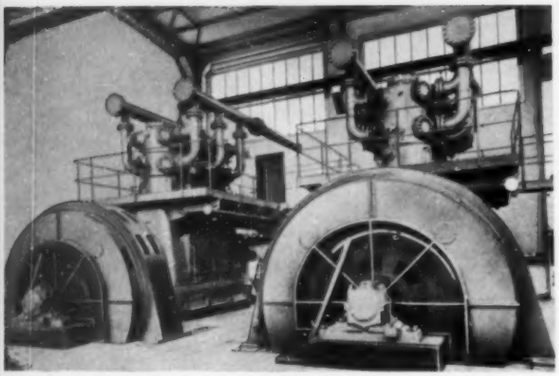
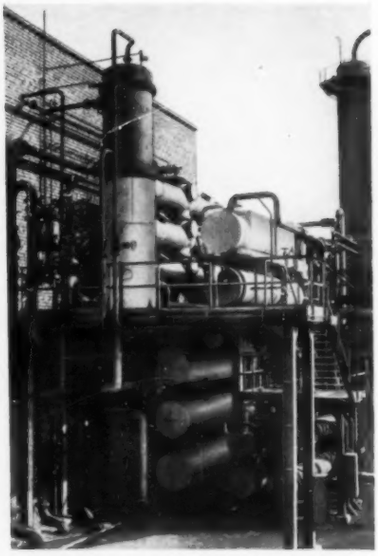


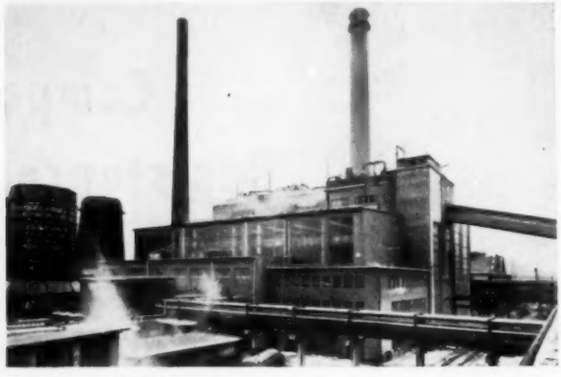
Fractionating columns, total weight incl. internals 985 tons, made and erected by BORSIG, Berlin, for a crude oil distilling plant; highest atmospheric tower 155 ft, outside dia 13 ft, weight 100 tons



Non-lubricated recycle gas compressors of a refinery in Western Germany. Capacity 57,700 scfm each, suction pressure 440 psia, discharge pressure 725 psia, power consumption 2850 HP each



Total view of a BORSIG absorption refrigerating machinery operating on waste heat of oil, for cooling liquid hydrocarbons. Capacity: 232 tons of refrigeration at 28/104° F



Power Station 60 MW

9098 48 Ae

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any kind, operating on all refrigerants. Piston and turbo compressors, condensers, evaporators and coolers. Low-temperature cooling equipment for liquids and gases. Low-temperature gas liquefying plants. Absorption refrigerating plants, single and multi-stage, e. g. for waste heat recovery. Refrigerating plants for water recooling and air conditioning.

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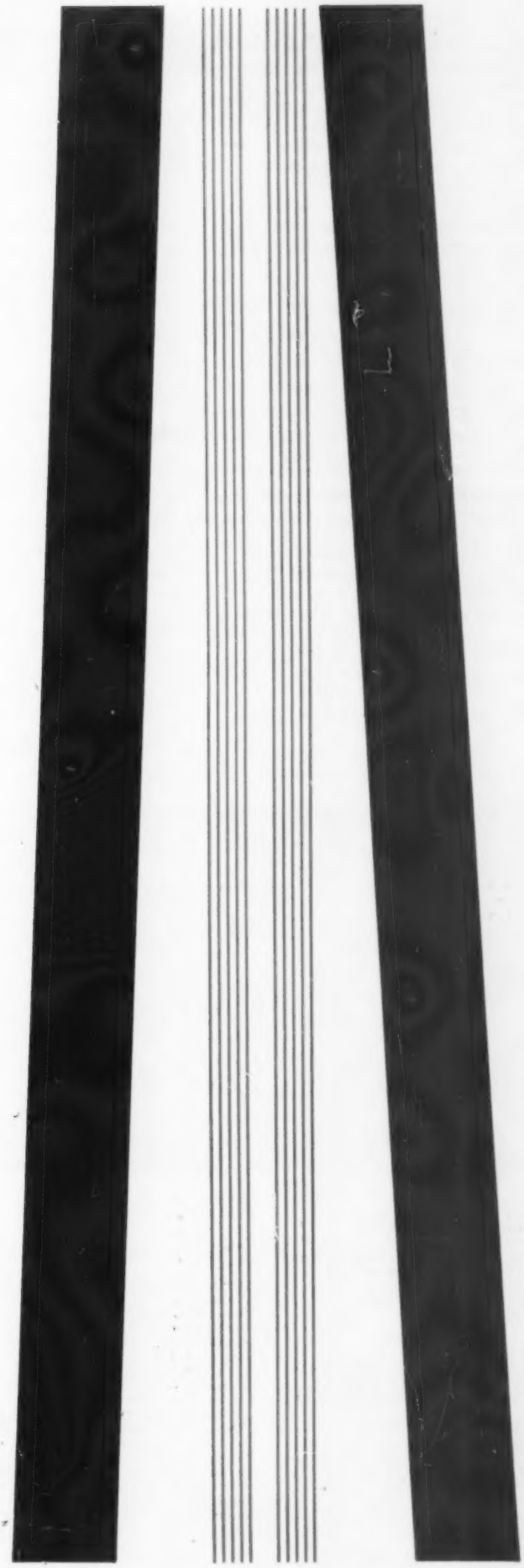


DEUTSCHE
SCHACHTBAU- UND
TIEFBOHRGESELLSCHAFT M. B. H.

DRILLING
AND
CRUDE
OIL
EXPLOITATION

LINGEN-EMS GERMANY

the century, several federal states of the former German Reich introduced the state prerogative for petroleum, i.e., the right for exploration and exploitation is owned by the state and can be leased to private individuals and companies.

The respective laws on the introduction of the state prerogative for the exploration and exploitation of petroleum decreed by the federal states of the former German Reich—the borders of which, by the way, do not coincide with today's federal states of the West German Federal Republic—are the following:

Lubeck	Law of March 21, 1904
Schaumburg-Lippe	Law of March 28, 1906
Bremen	Law of July 15, 1906
Oldenburg	Law of August 3, 1908
Bavaria	Law of August 13, 1910-August 17, 1918
Hamburg	Law of July 3, 1911
Brunswick	Law of June 13, 1917
Wurttemburg	Law of March 29, 1918
Badenia	Law of April 17, 1918
Hessia	Law of August 26, 1922-March 26, 1929
Lippe	Law of July 4, 1927

For the state of Prussia, regulation of exploration and exploitation of petroleum was introduced by the Petroleum Act of December 13, 1934. The Petroleum Act refers in many respects to the provisions of the above mentioned General Prussian Mining Act, which deals with the exploration and exploitation of minerals in general.

The above acts are still in force today notwithstanding the changes which have taken place since 1945 concerning the borders of the federal states. Particularly the Prussian Petroleum Act of December 13, 1934, applies within the borders of the former Prussian state, i.e., in the following states of the West German Federal Republic: Schleswig-Holstein, Lubeck, Lower Saxony, Hessia, North Rhine-Westphalia, and Rhineland-Palatine, as well as in parts of the former federal states of Brunswick and Hessia.

GERMANY (WEST)—Petrochemical Production in Western Europe

(In 1,000-Ton Carbon Capacities)

	1955	1956	1957	1958*	1960*
Federal Republic	110	134	166	187	395
France	36	50	80	141	400
Italy	26	39	73	131	171
Great Britain	198	219	274	327	301
Netherlands	27	31	36.5	44.5	56
Belgium					17

*Planned.

GERMANY (WEST)—Crude Imports

(Millions of Metric Tons)

Year	1950	1951	1952	1953	1954	1955	1956	1957	1958
Elbe	1.4	1.9	2.2	2.4	3.8	4.5	4.7	4.5	5.8
Weser	0.2	0.5	0.5	0.6	0.6	0.8	0.9	0.8	1.1
Rhine	0.7	1.1	0.7	1.5	1.6	1.8	2.4	2.9	3.8
Total	2.3	3.5	3.4	4.5	6.0	7.1	8.0	8.2	10.7

Apart from these territories of the former federal state of Prussia, the Petroleum Act is also applicable in Hamburg, Bremen, and in the Saarland. The major part of the present petroleum production is carried on within the territories of the former Prussian federal state.

The Chief Mining Board of Clausthal-Zellerfeld, as supervising authority, is competent for the territories of Lower Saxony, Schleswig-Holstein, Hamburg, and Bremen and it controlled, in 1953, 98.3% of the entire petroleum production of the West German Federal Republic. Therefore, the Prussian Petroleum Act of December 13, 1934, is of particular importance, and the following outline of legal questions connected with exploration and exploitation of petroleum is based on this act.

Legal regulations in those territories of the West German Federal Republic not covered by the Prussian Petroleum Act are very similar, and differences are minor. For example, in Bavaria the license for exploration and exploitation of petroleum is granted by a public administrative act; whereas, in the territory

GERMANY (WEST)—Production of Petrochemicals by Selected Countries (1957)

(Figures in Tons of Carbon Content)

	Aliphatic Chemicals C_1 Carbon monoxide and methane	Aliphatic Chemicals C_2&C_3 Acetylene Ethylene Propylene	Aromatic Chemicals Benzene Naphthalene
USA	375,000[1]	2,145,000[2]	1,335,000
Federal Rep. Germany	130,000	265,000	240,000
France	—	95,000	90,000

[1] Excludes carbon monoxide.
[2] Includes ethanol.

Note: Figures for the Federal Republic of Germany have been combined from all West German production companies. Figures for the USA have been partly calculated, partly estimated from published production figures.

Source: OEEC.

covered by the Prussian Petroleum Act proper, license and lease contracts are concluded with the competent Chief Mining Board as representative of the respective state.

It may be pointed out that within the territory of the German Democratic Republic (East Germany), according to Art. 25 of its constitution, all minerals, including petroleum, have become the property of the people, so that all mineral rights are owned by the state also within the territory of East Germany.

Regulatory authorities for exploration and exploitation of petroleum, especially for the granting of permits and license and lease contracts, are the Chief Mining Boards of the towns of Clausthal-Zellerfeld, Dortmund, Bonn, Karlsruhe, and Munich. As already mentioned above, the Chief Mining Board of Clausthal-Zellerfeld is the most important authority on all petroleum matters.

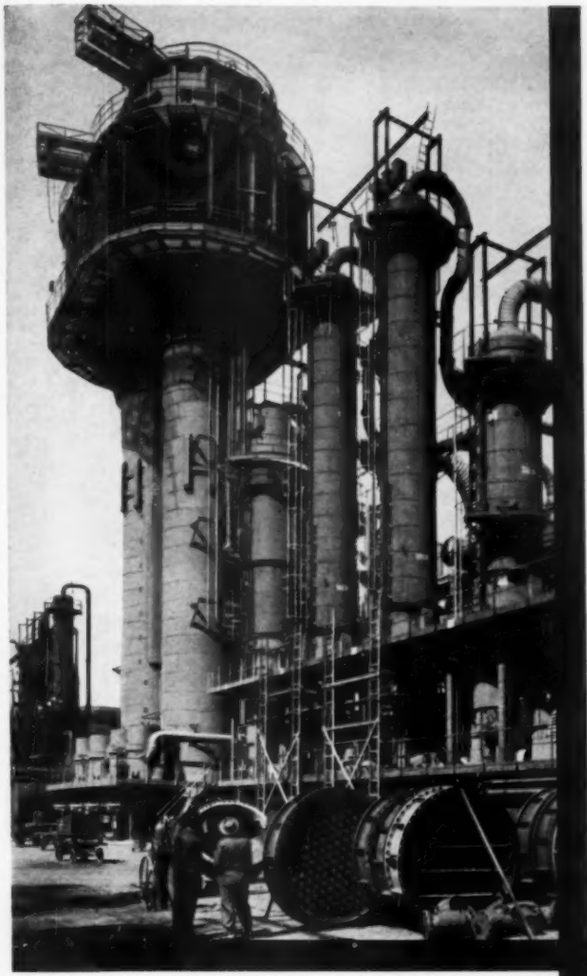
Since the right for exploration and exploitation of petroleum has been transferred to the state by the Prussian Petroleum Act, this act ruled simultaneously that all contracts for ex-

PIPELINES IN GERMANY, OTHER WESTERN EUROPE, AND NORTH AFRICA

Owner and/or Operator	Route (From-To)	Completion (Date)	Length (Miles)	Diam. (Inches)	Capacity (1,000 b/d)	Annual Throughput (1,000 Bbl.)	Commodity Carried
GERMANY:							
Deutsche Schachtbau & Tiefbohr G.m.b.H.	Lingen-Osterbrook on Dortmund (Ems Canal)	—	6	6	13.5	—	Crude
Deutsche Schachtbau & Tiefbohr G.m.b.H. and Gewerkschaft Elwerath	Ruehlemoor-Lingen	—	6	6	—	—	Crude
Emsland-Erdoelleitung (C. Diehmann Bergbau G.m.b.H., Gewerkschaft Elwerath, Preussag, Wintershall, A.G.)	Ruehlertwist-Osterwald (R.R.)	—	11	5	1.95	—	Crude
Erdoelbetrieb Reitbrook (Soc. Vac. and Presassagg)	Reitbrook-Warwisch (Elbe River)	—	5 5	6 8	—	—	Crude
Preussag	Georgsdorf-Veldhausen (R.R.)	—	4 4	4 4	—	—	Crude
Wintershall A.G.	Emlichheim-Emlichheim (R.R.)	—	2.5	6	102.8	—	Crude
Deutsche Vacuum Oel A.G. & Gewerkschaft Brigitta	Suderbruch-Gilton (R.R.)	—	4	6	—	—	Crude
Niedersaechsische Oelleitungs G.m.b.H.	Hohne-Beedenbostel (R.R.)	—	8	4	—	—	Crude
Nord-West Oelleitungs G.m.b.H. Shareholders: Esso A.G. 47.2%, B.P. 26.3%, Ruhrbau 8.3%, Scholven-Chemie 7.7%, Union Rheinische 6.8%, Ruhrchemie 3.7%	Wilhelmshaven-Wesseling Ruhr	Late 1958	242	28	—	65,700[4]	Crude
D.E.A.	Brunsbuttelkoog-Hemmingstadt	1953	22	6	—	—	Crude
D.E.A. (Vacuum and Preaubag)	Boostedt-Klein Kummerfeld	—	2.5	6	—	—	Crude
Brigitta and Vacuum	Hemmelte-West-Bartmannsholte	—	3.7	6	—	—	Crude
Brigitta	Steimbke-Hagen	—	19	6	—	—	Crude
E.E.G.	Scheehorn-Osterwald	—	2	4	—	—	Crude
E.E.G.	Osterwald-Lingen-Holsthausen	—	14	5	—	—	Crude
HAFAG (Duisburg-Ruhrorter Hafen A.G.)	Duisburg-Ruhrort-Oberhausen	—	8	6	—	—	Crude
HAFAG (Duisburg-Ruhrorter Hafen A.G.)	Duisburg-Ruhrort-Gelsenkirchen	—	18	8	—	—	Crude
HAFAG (Duisburg-Ruhrorter Hafen A.G.)	Gelsenkirchen-Gelsenkirchen-Buer and, Gelsenkirchen-Horst	—	2	8	—	—	Crude
D.E.A. (Deutsche Erdol A.G.)	Hemmingstedt-Brunsbuttelkoog	1953	22	5	—	—	Liquid Fuel
E.E.G.	Frenswegen-Georgsdorf	—	6	3	—	—	Natural Gas
E.E.G.	Georgsdorf-Scheerhorn	—	3	3	—	—	Natural Gas
E.E.G.	Itterbeck-Halle-Frenswegen	1953	7	5	—	—	Natural Gas
E.E.G.	Frenswegen-Nordhorn/Bentheim	1953	12	8	—	—	Natural Gas
Wintershall	Frenswegen-Nordhorn	—	2.5	2.5	—	—	Natural Gas
Deilmann	Bentheim-Huels	—	48	8	—	—	Natural Gas

(Continued on page 242)

GEA



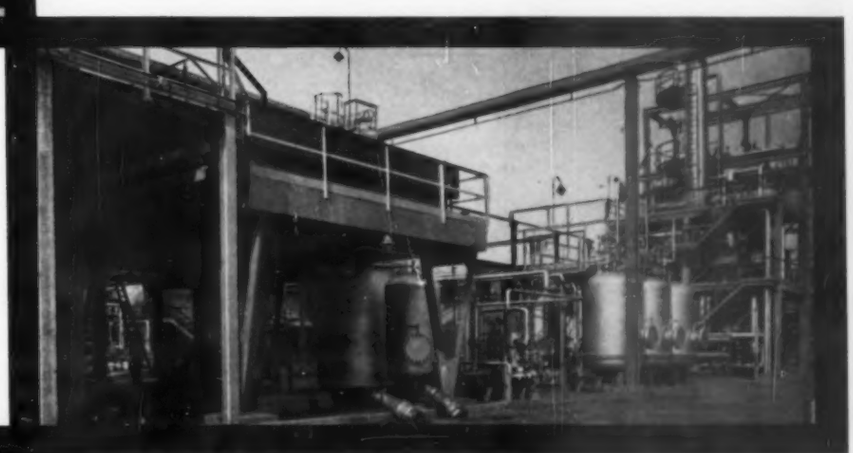
companies plan, estimate, design, and manufacture air cooled plants, especially for petrol refineries and the chemical industry. Design and manufacture of the units are corresponding to A.S.M.E. — Code and A.S.A. as well as D.I.N. and A.D.N. Standards.

GEA built the biggest air cooled condenser of the world for condensation of waste steam of a turbine power station in 1957/58. Heat load 300 Mill. BTU. Capacity 72 MW. Pressure at the turbine socket 0,857 p.s.i.a. Erection site power station Citta di Roma, 112 miles from Rome/Italy.

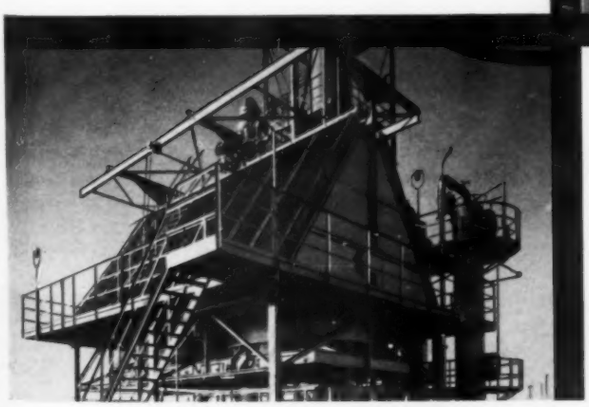
During the last 10 years GEA has built about 1000 units, which have a heat load of more than 12 billions BTU, i. e. air cooled plants for power stations, chemical industry, petrol refineries, and refrigeration industry, for steel mills and coal mining.

40 years of experience on the field of fin tube heat exchangers have led to the fact that during recent years GEA has found special solutions for various heat exchange problems, as air cooled condensers on top of columns and air cooled heat exchangers for products with a freezing and high melting point.

Air cooled gas-oil cooler for a steam cracker plant of ESSO Refinery, Cologne (Germany).
The usual type of horizontal construction with forced draft fan.
Heat load 18,4 Mill. BTU
Cooling from 358 to 200° F
Air design temperature 92° F



Air cooled condenser for polystyrene on the top of 2 destillation columns of 16 ft. Diameter, located at BUNAWERK Hüls (Germany).
Heat load 48 Mill. BTU
Condensation temperature 122° F
Air design temperature 68° F
Pressure 1,5 in Hg



Air cooled condenser for propylene at DEA Petrol Refinery, Heide (Germany).
The well-known type of roof construction developed bei GEA.
Heat load 9,6 Mill. BTU
Condensation temperature 95° F
Air design temperature 68° F

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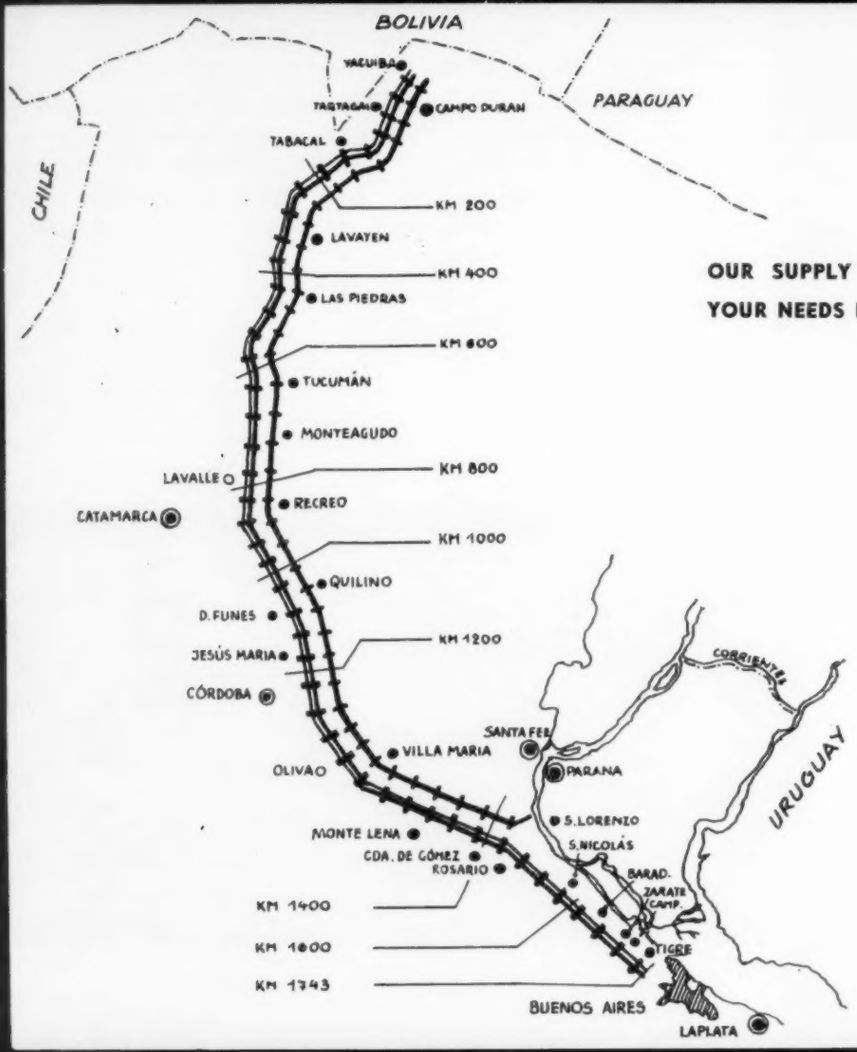

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EUROPEAN AND NORTH AFRICAN PIPE LINES

Owner and/or Operator	Route (From-To)	Completion (Date)	Length (Miles	Diam. (Inches)	Capacity (1,000 b/d)	Annual Throughput (1,000 Bbl.)	Commodity Carried
ALGERIA:							
SOPEC (Compagnie Francaise des Petroles and S.N. REPAL)	Hassi Messaoud-Bougie	Oct. '59	387	24	—	29,200[1]	Crude
AUSTRIA							
Soviet Mineral Oil Administration	Zistersdorf-Labou	—	31	12	—	—	Crude
BELGIUM:							
Distrigaz Cy-Brussels	Esso Antwerp refinery—Societe d'Electricite de l'Escaut-Marxem (Antwerp Suburb)	—	6.2	14	—	—	Refinery; Dry Gas
FRANCE:							
Esso Standard S.A.F.	Le Havre-Port Jerome	1933	2.9 22.4	8 10	52.8	69,600[2]	Crude
Esso Standard S.A.F.	Abalso-Port Jerome	1951	19.5	10	408		
Shell Berre	Le Havre-Petit Couronne	1952	47	14	60	39,340	Crude
Cie Francaise de Raffinage	Le Havre-Gonfreville	1949	6.25	16	105.6	64,750	Crude
Shell Berre	Lavera-Berre	1950	20	14	75.6	74,740	Crude
Cie Francaise de Raffinage	Lavera-La Mede	1952	7	16	105.6	60,700	Crude
Marseilles Chamber of Commerce	Sea-line at Lavera	1952	1.25	14	144	57,100	Crude
Socony Vacuum Francaise	Sea-line at Frontignan	1948	2.13	12	108	21,690	Crude
Cie Francaise de Raffinage	Gonfreville-LeHavre	1933	6.25 6.25	8 10	52.8 63.6	5,000	Products
Cie Francaise de Raffinage	La Mede-Garonte	—	5 5	12 12	45.6 45.6		
Socony Vacuum Francaise	Frontignan-Sete	Before W.W.II	4.63 4.63 4.13 0.6	8 8 10 8	18 to 24	—	Products
Regie Autonome des Petroles	St. Marcet fields to Pau, Tarbes; Toulouse, Montauban; and Agen, Bordeaux	1942	509	6 to 10	60 to 135.8	9,740	Gas
Gaz de France	Sarreguemines Metz-Paris	1954	194	12	39	—	Gas
Socony Vacuum Francaise	Frontignan-Sete	Sept. '55	4	6	—	—	Gas
Gaz de France	Ambes-Bordeaux	Oct. '55	12	8	—	—	Gas
Trapil (Societe des Transports Petroliers par Pipe Lines)	Le Havre-Paris	Apr. '53	150	10	34.8	12,911	Products
Esso Rep	Parenti -Ambes	Apr. '58	60	12	—	12,045 to 20,440[3]	Crude
S.E.P.L. (Societe du Pipe-Line Sud-European)	Lavera-Karlsruhe, Strasbourg	Jan. '63	475	30	200 to 400	73,000[4]	Crude
ITALY:							
Sarpom (Caltex 50%; Fiat 50%)	Savona-Trecate	1952	90	8	19	3,000[5]	Crude
Condor	Genoa-Rho	1953	80	12	46.8	14,600[6]	Crude
Societa Petrolifera Italiana	Vallezza-Fornova	—	4.6	3	2.0	—	Crude
INPET (Societa per l'Industria Italiana del Petrolia)—Shell	La Spezia-Harbour	—	1.5	2 at 12 1 at 8 1 at 6	—	—	Crude and Products
E.N.I. (Italian State Oil Company)	Genoa-Switzerland	Approx. 1962	260	20 to 28	—	15,000[6]	Crude
MOROCCO:							
Societe Cherifienne des Petroles	Bou Draa-Petitjean	—	1	2	0.28	—	Crude
Societe Cherifienne des Petroles	Tselfat-Petitjean	—	12	2	0.28	—	Crude
Societe Cherifienne des Petroles	Aim Hamra-Karia (R.R.)	—	2	2	0.15	—	Crude
NETHERLANDS:							
Shell	Pernis-Vlaardingen	1950	1	6 at 6	5.25	1,500	Products
R.R.P. (N.V. Rotterdam-Rijn Pijpleiding Maatschappij)—Shell/Caltex/Gelsenberg	Rotterdam-Wesseling/Godorf	July '60	193	24	—	54,750[4]	Crude

(1) Initially; expected throughput by 1962—102,200,000 bbl/yr.
(2) Includes 59,180,000 bbls for Esso S.A.F. and 10,420,000 bbls for Socony Vacuum.
(3) Anticipated throughput.
(4) Initially; ultimate throughput will be 146,000,000 bbl/yr.
(5) Actual figure; anticipated throughput—7,300,000 bbl/yr.
(6) Anticipated throughput.

ploration and exploitation of petroleum concluded by real-estate owners prior to the coming into operation of said act shall remain in force, so that the territories covered by these agreements do not fall under the state prerogative of the Petroleum Act. Especially the royalty claims of real-estate owners arising from such contracts are not affected by said act.

RECONNAISSANCE: On application of the Chief Mining Board, a preliminary permit for geological and geophysical investigation may be granted to a petroleum operator (hereinafter referred to as "operator"). On further application to the Chief Mining Board, a preliminary permit for test drilling will be granted.

EXPLORATION: The Chief Mining Board may subsequently grant license contract covering the exclusive right to do exploration work, including drilling, subject to the approval by the competent Ministries of Traffic and Economics. By said license contracts, the operator is alloted for the term of five years an area exactly defined in its limits, up to about 500 square kilometers. There is no limit on the number of contracts for exploration which may be granted a single individual, company, or partnership.

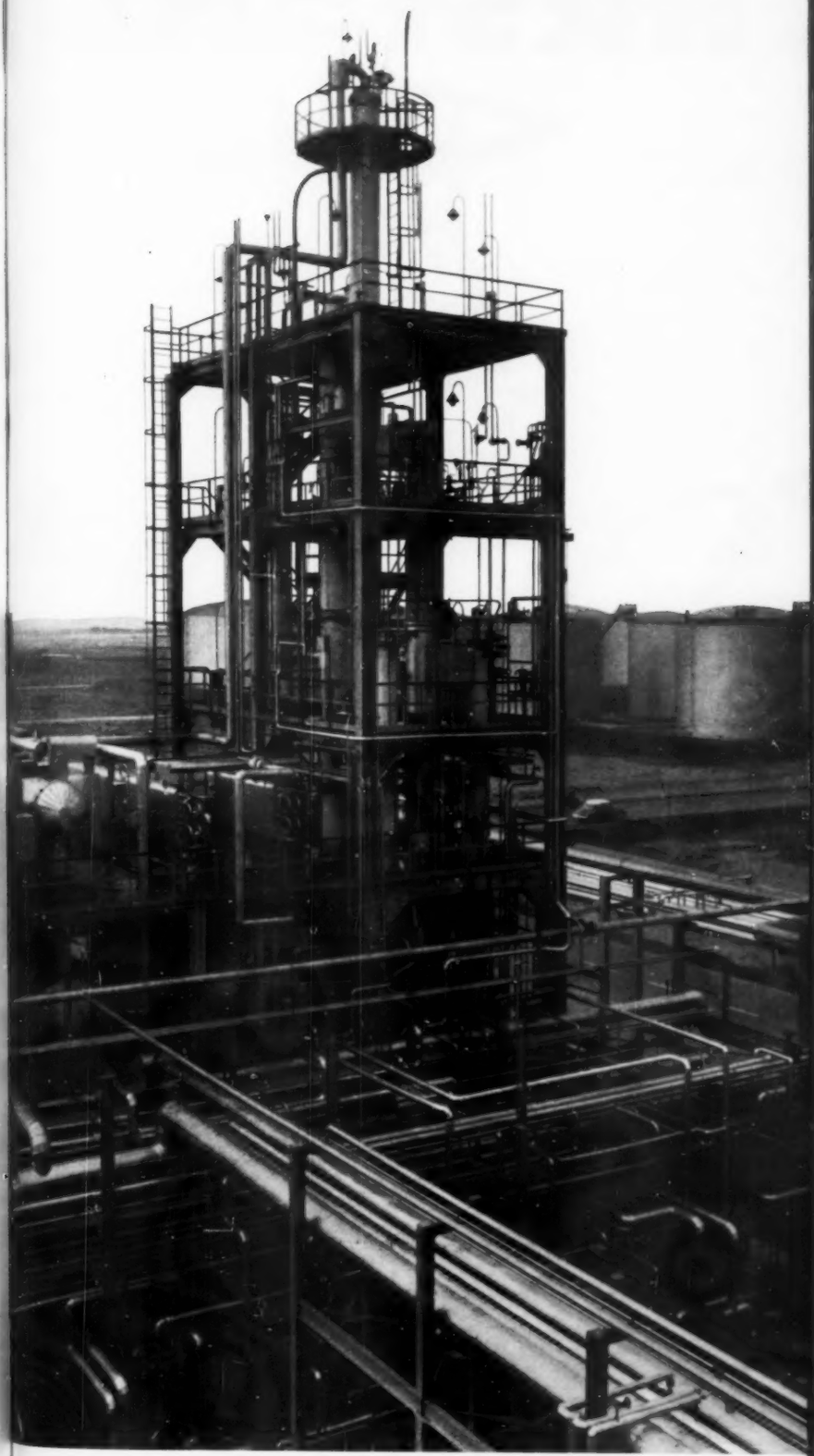
The operator is obligated to conduct exploratory drilling—if he fails to do so, the Chief Mining Board may terminate the contract after a reasonable period of notice.

A fee of DM 1,000 (US $238) is payable on conclusion of the license contract. No other fees are payable except for special operations, as for instance during exploratory drilling, when a preliminary permit costing DM 250 (US $59) is payable.

Duration of the permit is to be specified in the contract. It may be extended if exploratory work has not been terminated.

EXPLOITATION: If discovery is made, the operator has a guaranteed right to an exploitation lease covering the exploration area to be staked in agreement with the Chief Mining Board. Said area is split into lots extending up to 4.4 kilometers around the drilling well. Dis-

(Continued on page 256)



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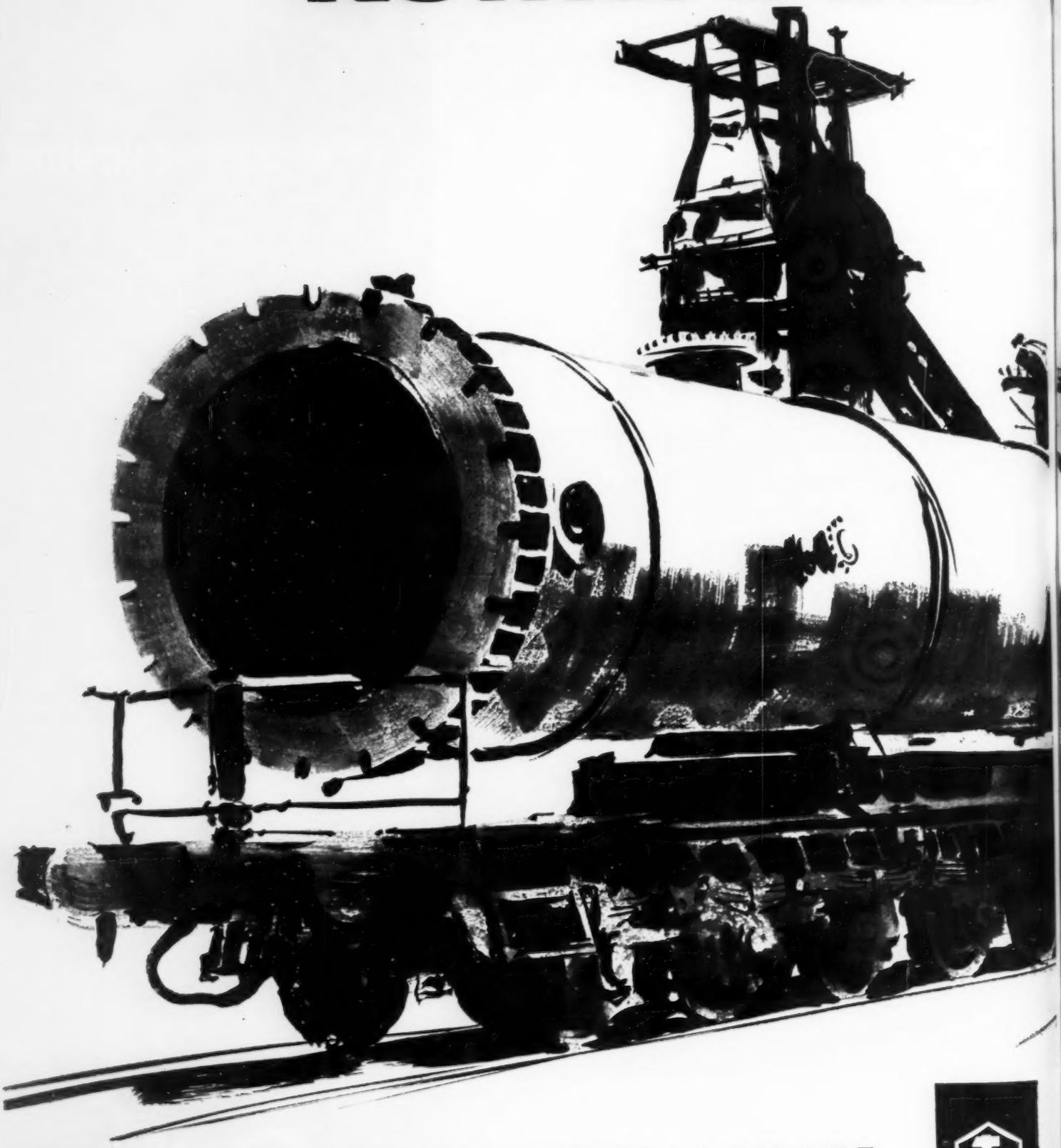

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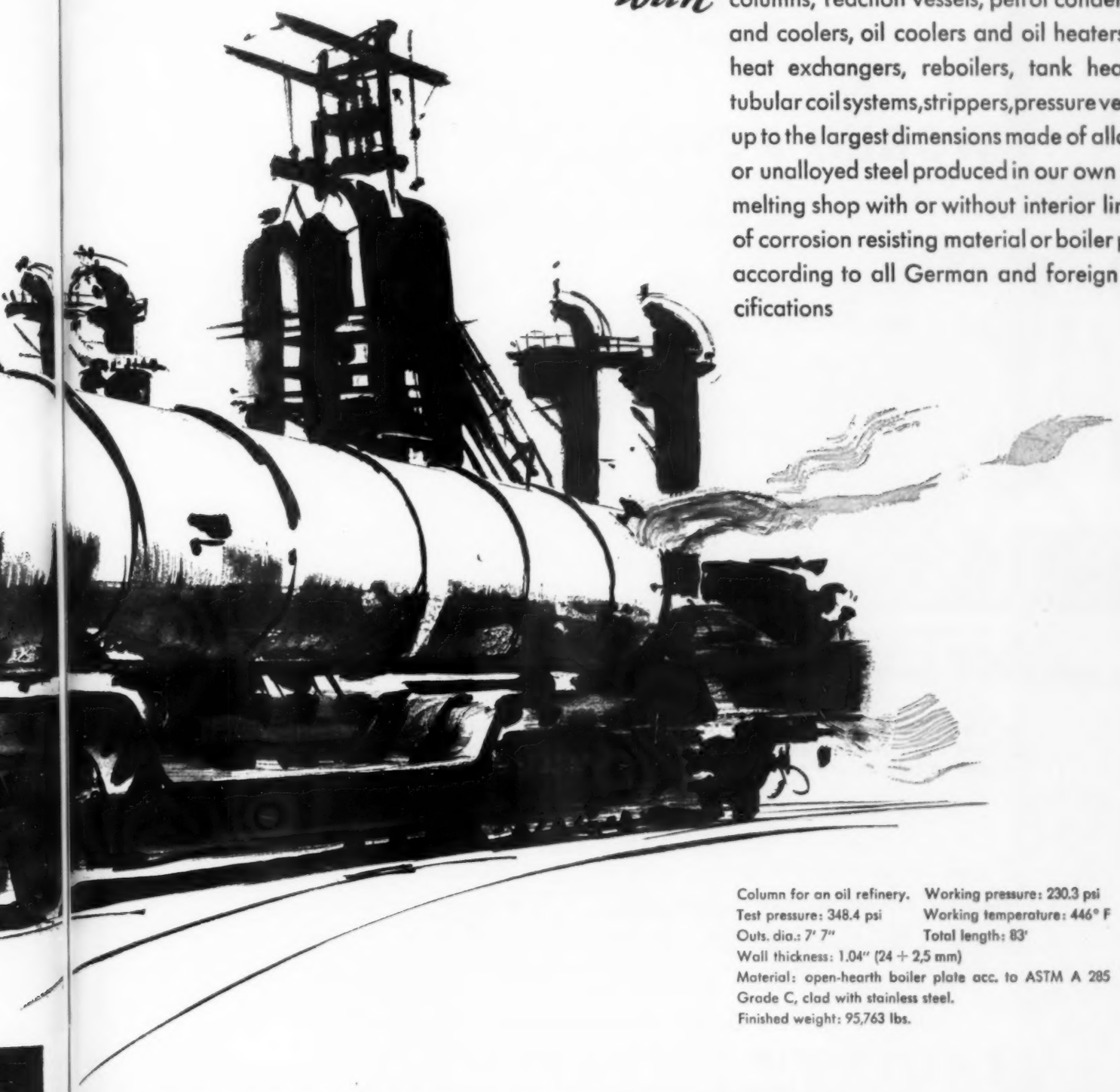

Column for an oil refinery.
Test pressure: 348.4 psi
Outs. dia.: 7' 7"
Wall thickness: 1.04" (24 + 2,5 mm)
Material: open-hearth boiler plate acc. to ASTM A 285 Grade C, clad with stainless steel.
Finished weight: 95,763 lbs.
Working pressure: 230.3 psi
Working temperature: 446° F
Total length: 83'

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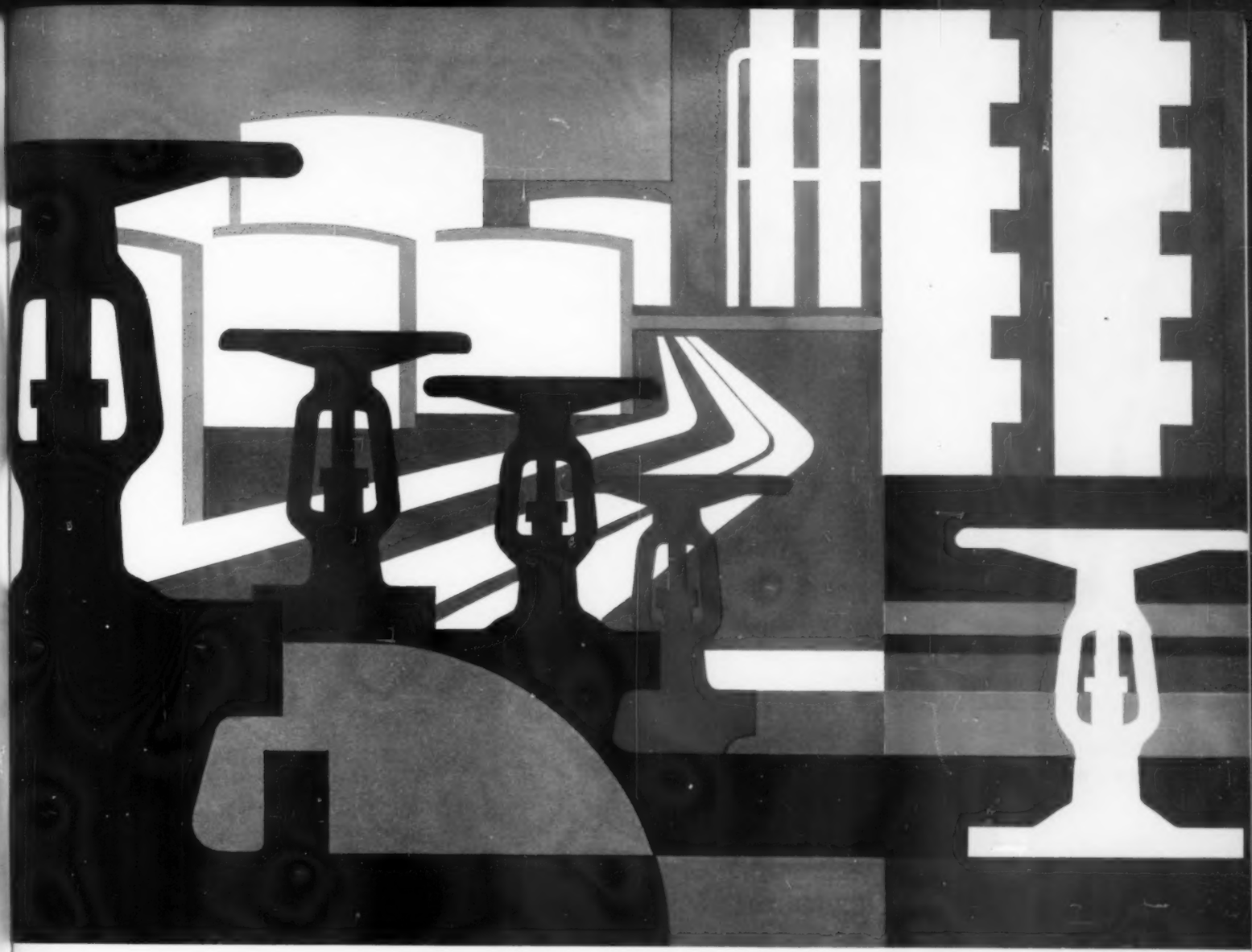

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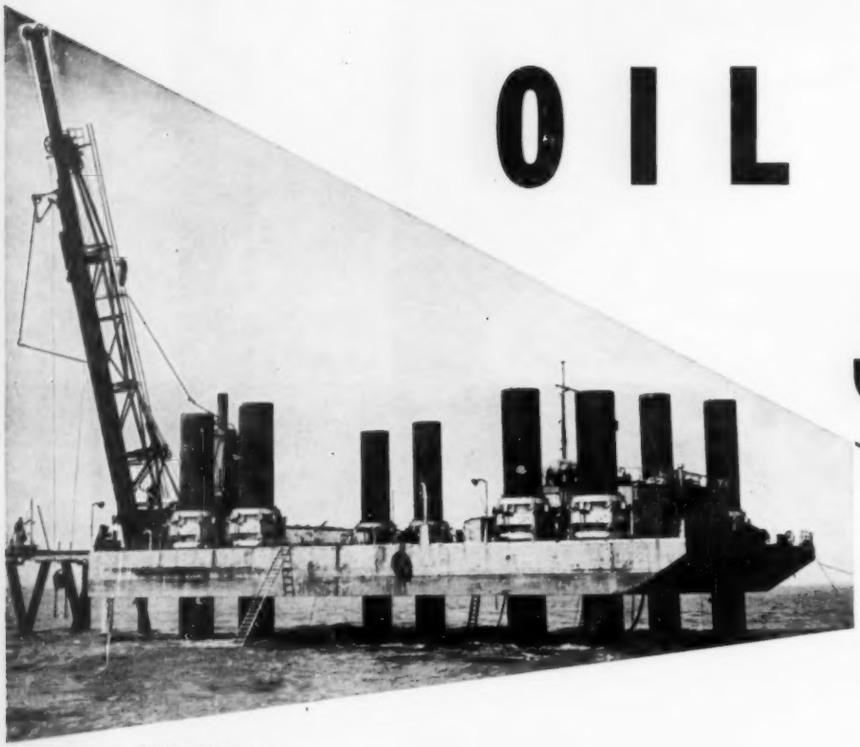

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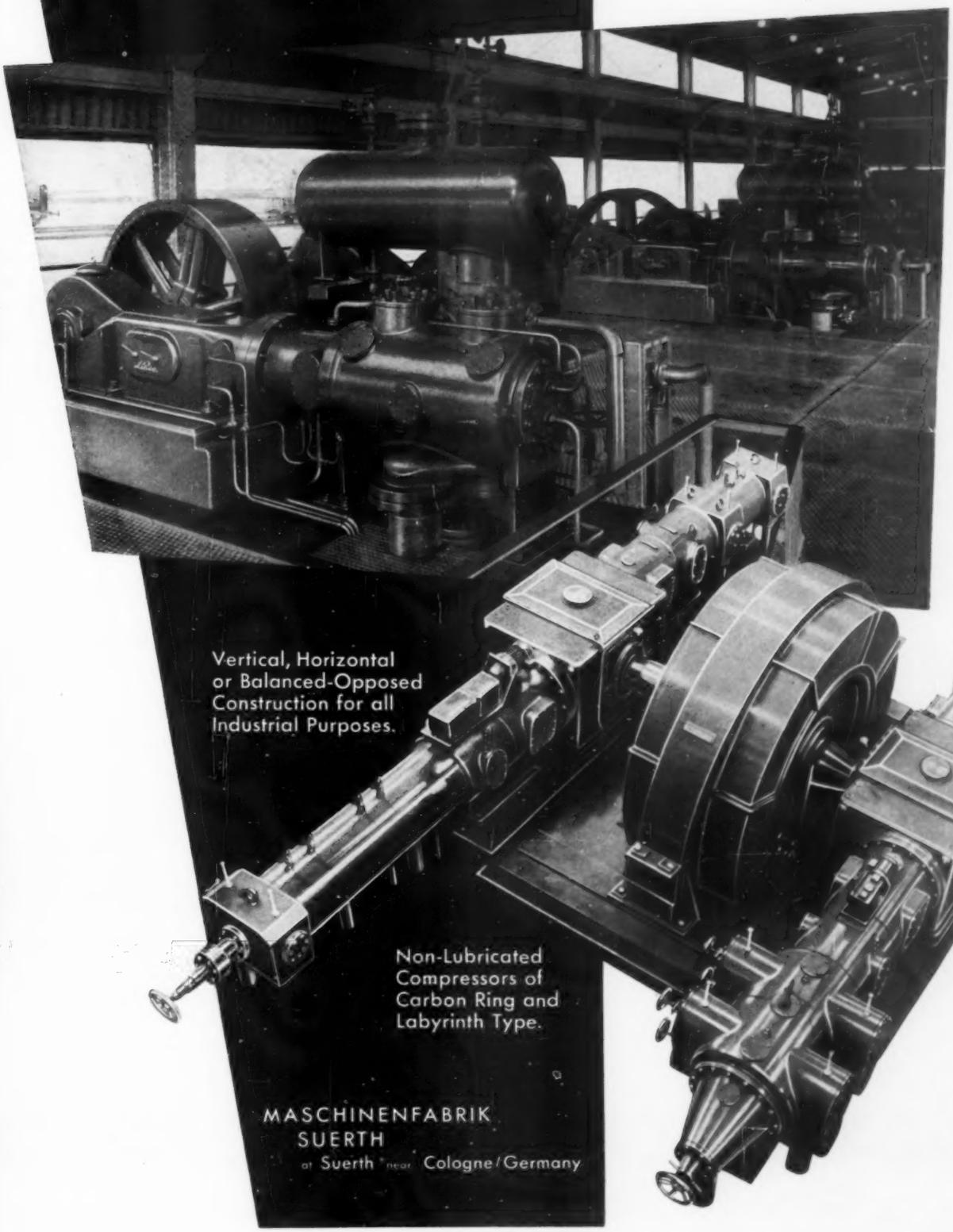

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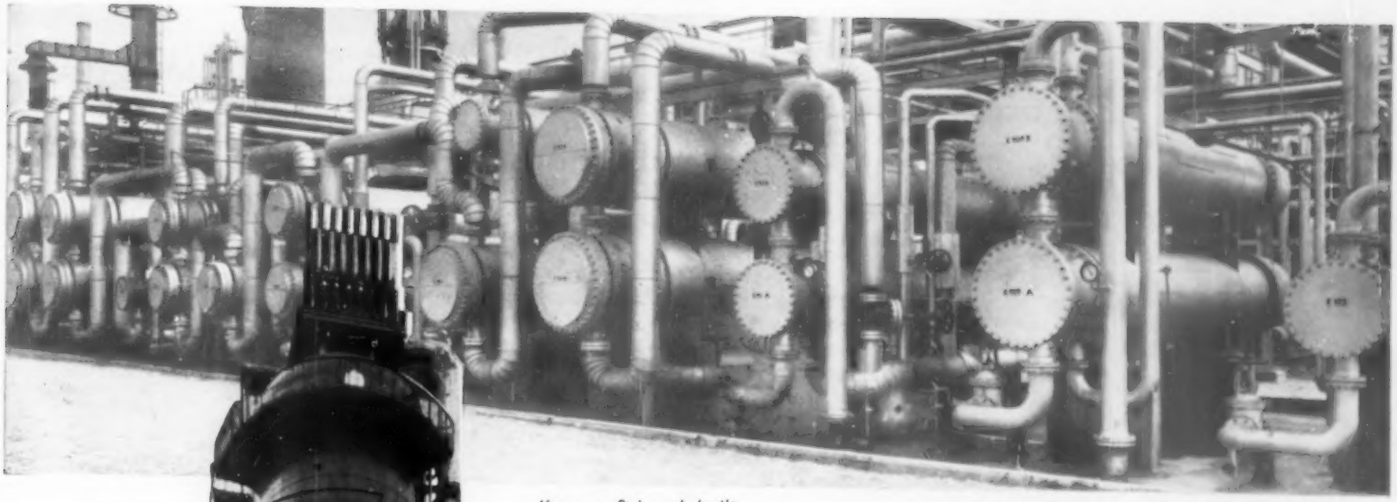

Koerver & Lersch built
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for ESSO refinery
Cologne

Atmospheric Destillation Tower
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Length: 167 ft.
Weight: 180 to.
Material: Carbon steel,
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With the increasing need of energy the consumption of petroleum products has risen since World War II at an inmpressive rate in the neighboring countries of the Grand-Duchy of Luxembourg. The production of petroleum itself is rather insignificant in these countries, but the construction of installations for refining and for treating imported petroleum products has created numerous problems which the metallurgical industry has largely managed to solve.

The experience we have acquired in manufacturing and treating special steels in our Dommeldange Electric Steelworks has enabled us to take an important part in the supply of equipment for construction and the maintenance of such installations. The petroleum industry makes use of a very large range of steel qualities, which can be divided into three classes:

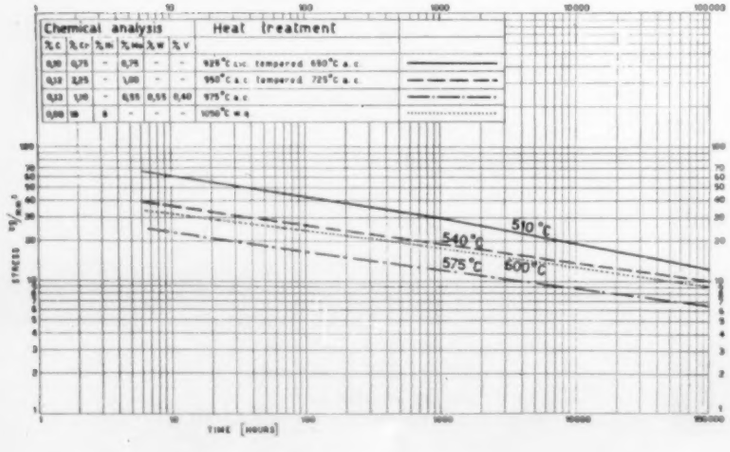
a. low and medium carbon steels
b. low alloy steels
c. high alloy steels

Numerous pieces manufactured in grades of the second and the third classes must resist corrosion as well as high temperatures and pressures. In spite of this, carbon steel represents by far the greater part of the tonnage consumed by the petroleum industry.

Soft steel, for example, is used in the form of rolled sections and sheets, not only for the construction of workshops, but also for the manufacture (by riveting or welding) of piping, containers, boilers, etc. Our shops at Eich have the necessary equipment and experience to provide such materials.

For other structural work—spare parts for engine pieces and heavy forgings in general—semi-soft steel is used in large quantities by the petroleum industry. We deliver in these grades of electric quality pieces of high tenacity, bolts, screw-nuts, connecting rods, shafts, etc. We have developed a steel with 0.4 to 0.5% carbon for oil drilling in various forms and sizes. These drills are delivered roughly forged to R = 60 to 70 kg per square mm.

Among the carbon steels of interest to the petroleum industry we especially wish to mention our brand "ARBED SEMI-MANAX," which contains approximately 1.50% Mn and 0.36 to 0.45% C, according to its use for riveted or welded constructions. It is used mainly in sheet form resistant to wear by abrasion. For years we have been supplying "SEMI-MANAX" sheets plain, shaped or perforated to coal-mines, ore-mines and numerous other industries. Thus we are able to satisfy all demands of the petroleum industry in this regard. Our wide range of plain sheets of different sizes and thicknesses permits prompt delivery:



Space doe not allow us to detail the classic structural alloy steels, containing more or less Cr, Ni, Cr-Ni, with an eventual addition of Mo or V, case-hardening or other steels, in spite of the essential part they form in our manufacturing program and their wide use in the petroleum industry.

We wish to provide, however, a special range different from the structural steels—low carbon steels with chromium added to varying contents of molybdenum. We have delivered these cast or forged steels, in the shape of bolts, piping or turbine casings to a great number of power plants in the countries of Western Europe (See analysis on diagram).

However these steels are useful not only to the power industry but also to petroleum industry in refineries for piping installations. The steel grades with Cr-Mo contents which we can produce at present enable us to solve the problems in applications under pressure and at temperatures not above 570° C, conditions which exist in petroleum refining. Topping and distillation require moderate conditions of temperature and pressure. Catalytic cracking operates at about 500° C and thermal cracking and reforming between 500 and 550° C, under a pressure of 50 Kg per sq. mm. Treatment of the gaseous products generally requires higher temperatures, up to 600° C for example in polymerization, or even higher according to pressures.

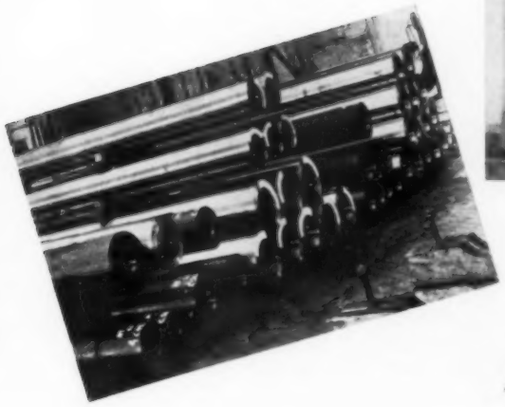
We do not wish to discuss here in detail the characteristics of chemical and physical stability of the ferritic Cr-Mo-steels for piping, but only to show on the above diagram, besides the chemical analysis of the three principal qualities used by the petroleum industry, the results of creep tests carried out at the indicated temperatures.

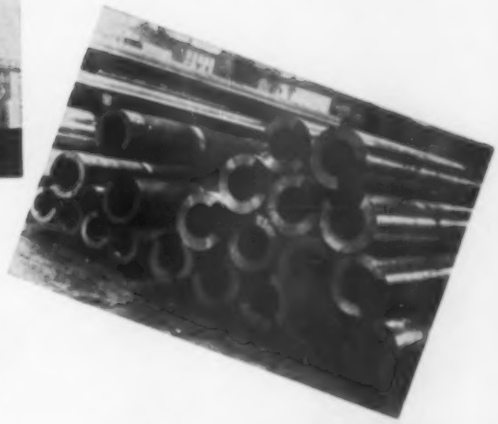
To this group also belongs the quality containing 5% Cr and 0.50% Mo, a characteristic steel of the petroleum industry, mainly in presence of hydrogen under high pressure.

Considering the way the quality containing 0.20% C, 12% Cr, 1% Mo and 0.50% min. V (introduced several years ago for manufacturing bolts, blades and discs for steam-turbines) has been adopted, it is to be expected that it will find a more and more intense application, owing to its chemical stability and its resistance to temperatures of about 600° C.

But with the increase of superheating temperatures in power plants and the rapid evolution of new refining and synthesis techniques in petroleum, other solutions have become necessary to go beyond the limits of 600° C. With the ferritic Cr-Mo steels, no further progress could be expected. The solution has been in the use of austenitic steels initially developed to solve corrosion problems. These have allowed us to manufacture castings and forgings in austenitic steel, such as tubing, piping, casings for pumps, and ventilators and containers of every kind for the petroleum industry. This was aided further as the standard austenitic 18/8 type evolved, impelled by requirements of chemical and petroleum industries, striving for a better stability either by increasing the Cr and Ni contents or by developing so-called stabilized qualities with Ti and Cb (Nb), with or without addition of Mo and other elements.

We soon realized the austenitic Cr-Ni-steels might be a select material for applications at high temperature. However, we are satisfied with mentioning the progress realized by their utilization, showing in the diagram the average results of creep tests carried out on our brand "NICROMINA," which corresponds to the standard type 18/8, in comparison with the heat properties of our ferritic Cr-Mo-steels sanctioned by experience.





ARBED

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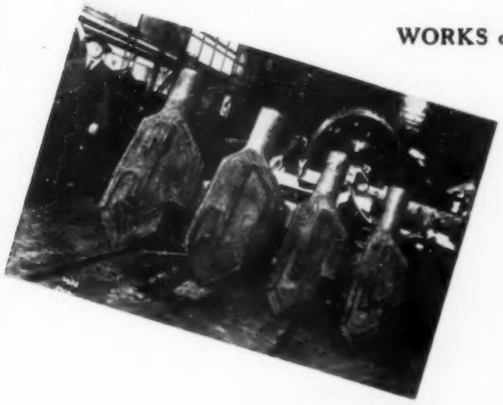

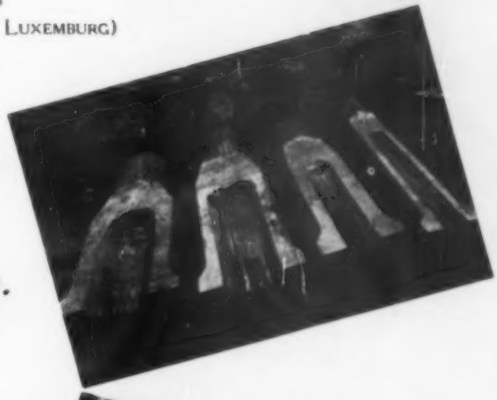

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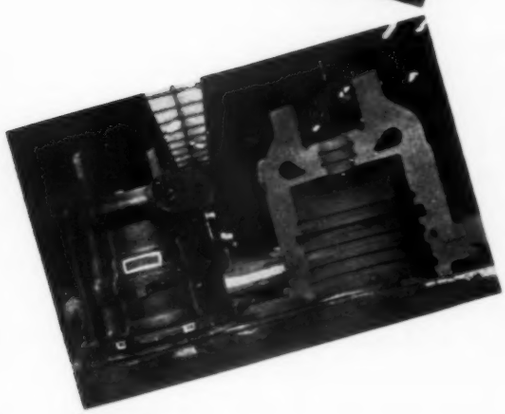

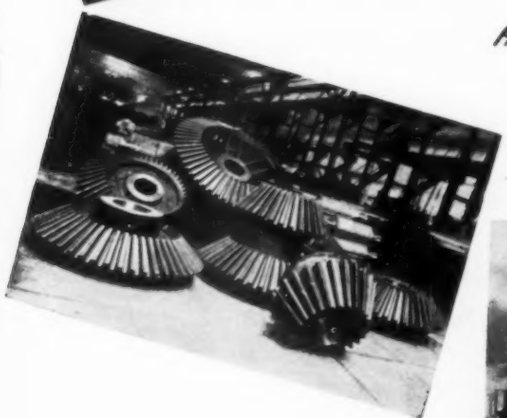

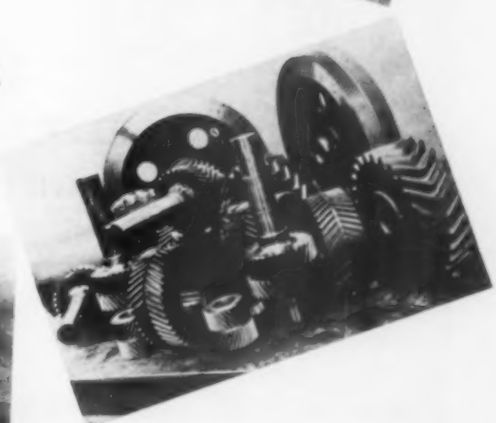

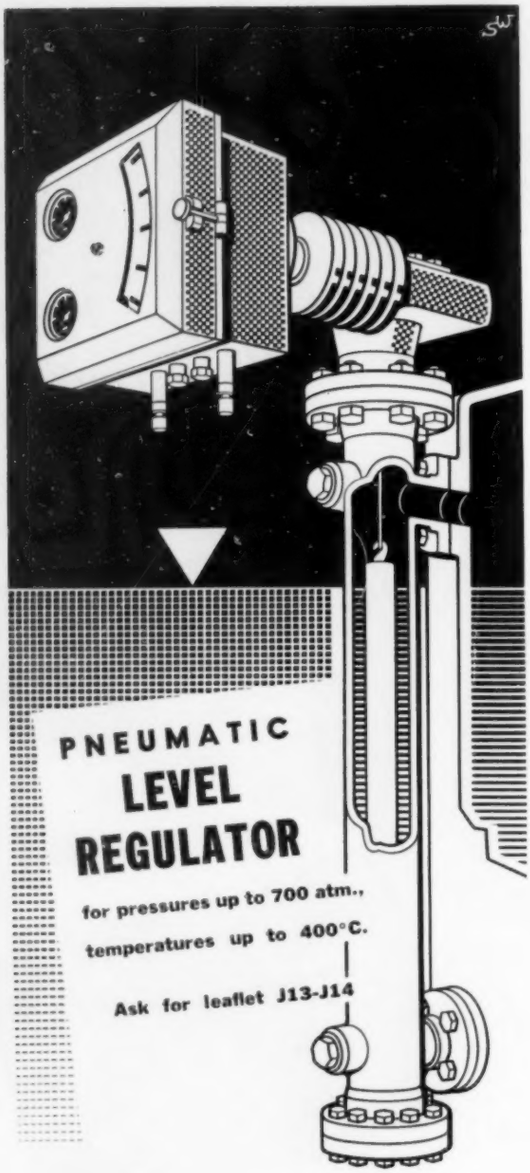

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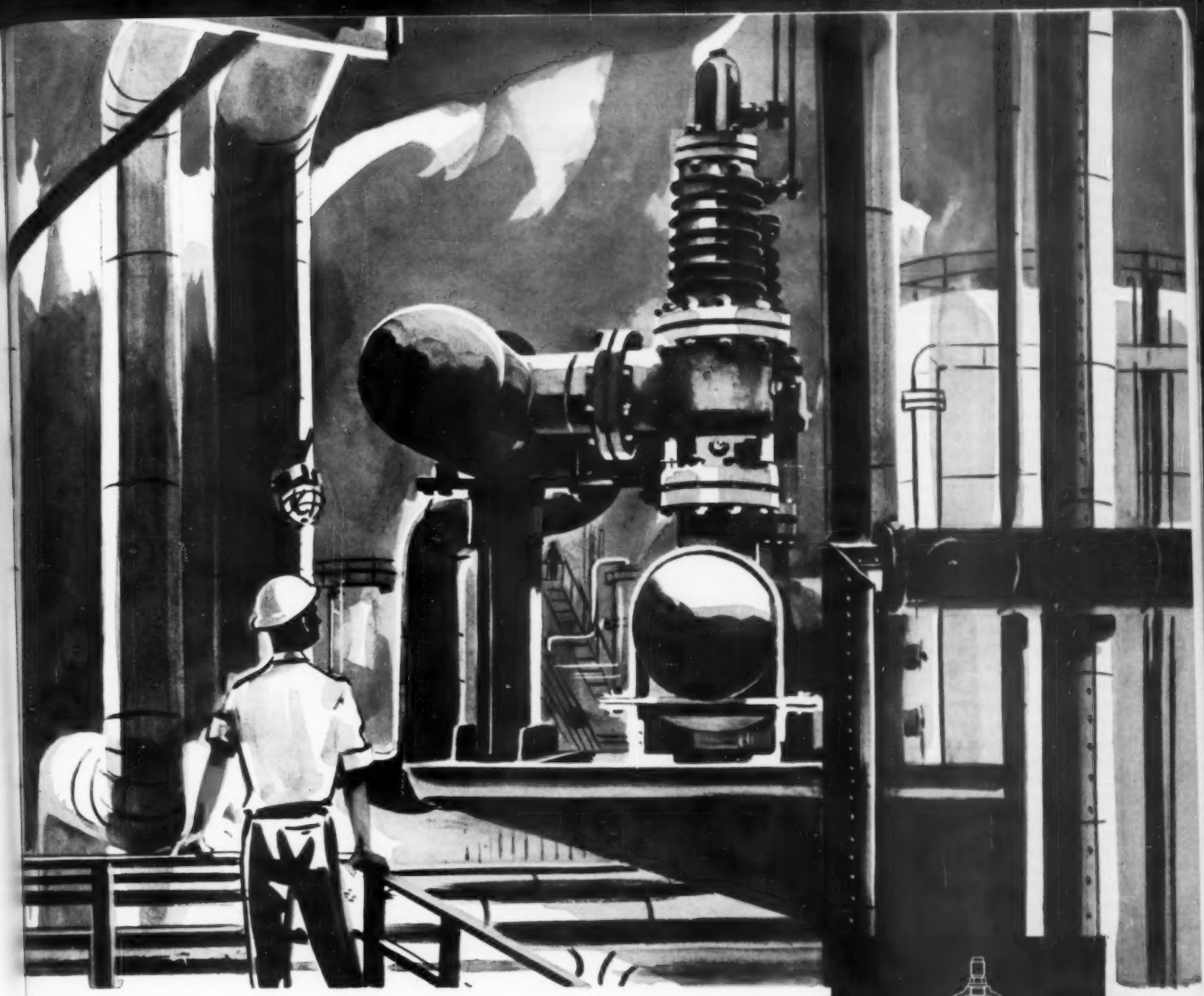

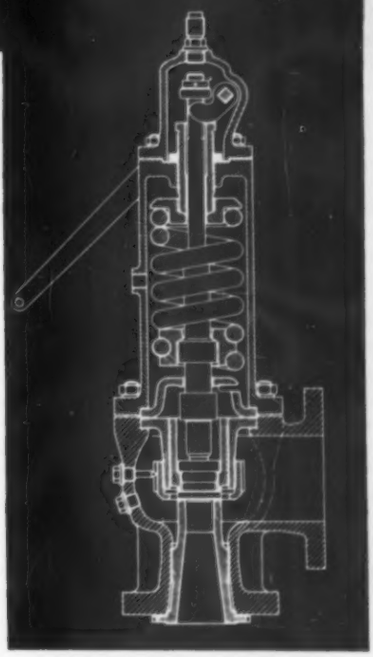

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covery of oil must be obtained before exploitation lease is granted.

Duration of the lease is 30 years. It may be extended if exploitation continues. There is no limit on the number of leases one company or individual may hold.

One of the obligations of the operator is to start development within a reasonable period and thereafter continue operations with diligence. Should the operator fail to do so, then the State is entitled to terminate the lease. The operator may at any time **surrender** the lease.

In case of production, a **royalty** is payable, in cash, to the State amounting to 5% of the gross petroleum production.

On expiration of the lease, the State can demand surrender of operating equipment plus accessories in a condition enabling the continuation of operations, subject to compensation being granted. Should the State not exercise this right, then the operator is obligated to clear the lease area. He must provide securities for each field of exploitation for obligations deriving from the lease. Where a well is no longer used, operator is obligated to plug it.

Transfer of rights arising from the license contract or lease is subject to approval by the Chief Mining Board. Any entities set up for the purpose of exploration and exploitation, as well as any changes or termination of same, have to be reported to the Chief Mining Authority. Copies of the contracts have to be submitted before concluding a license contract or lease.

The operator has to satisfy the Chief Mining Board as to his financial means by furnishing respective references. A calculation for the expected expenditures need not be presented. However, as a rule, the financial basis of operator must cover the expenses of approximately three deep wells.

Foreign equipment may be used at any time.

There is no appeal against the refusal of the conclusion of license contract, as there is no guaranteed right to a licensee to do exploration work. However, as previously explained, in case of discovery there exists a right to a lease for exploitation.

According to the Prussian Petroleum Act, the state prerogative does not apply to petroleum only, but also to natural gas, fossil wax, mineral pitch, and the minerals declared by the Chief Mining Board as technically utilizable on account of their bitumen constituents. As a rule, however, the license agreement and lease refer only to the exploitation of petroleum and natural gas. The Chief Mining Board can demand, in regular intervals, reports on the progress of work; it may, furthermore, inspect the books, records, etc., and control all equipment.

Regarding relations between the operator and owner of the land required for exploration and exploitation of petroleum, the respective real-estate owners must tolerate geophysical investigation work, drilling, and exploitation of petroleum on their land, when a permit has been granted to operator or when a license contract or lease has been concluded with the operator.

The landowner is entitled to a full compensation for loss of usufruct and any damage sustained in connection with the utilization of his land by the operator.

Operator must return the real estate after termination of operations. The landowner is entitled to demand a reasonable security. If utilization of the real estate takes more than three years, or continues still after expiration of this period, then real-estate owner can demand that operator acquire the ownership of the real estate. Should a real estate by the surrender of individual parts to operator be dismembered to such an extent that the remaining parts cannot properly be used any longer, an annual compensation has to be paid to the real-estate owner also for those parts of the real estate which can no longer be utilized. In such a case, the owner is furthermore entitled to demand that operator acquire ownership of the entire real estate. If pursuant to abovementioned measures a sale of the real estate to operator is concluded, owner has a right to pre-emption and repurchase in the case that at some future date the real estate becomes dispensable for the purposes pursued by operator. In case of disagreement on the compensation to be paid to the landowner, same is determined by way of legal proceeding with the ordinary court. Investigation or exploration activities are not suspended thereby if operator gives security.

Supervisory personnel employed by the operator must be qualified for their work. The names of the personnel have to be given to the Chief Mining Board. The personnel are obliged to prove their qualification, and on demand have to submit for this purpose to an examination by the Chief Mining Board. They may start their activities only after having been approved by the board.

Should the exploration and exploitation of petroleum be operated by several persons or firms, they are obliged to appoint by notarial or judicial document a representative domiciled in the Federal Republic of West Germany. The representative is authorized to represent the parties concerned in court and out of court in all matters connected with the operations. The same applies if the operator has his domicile outside of the West German Federal Republic.

If on demand of the Mining Authority a representative is not appointed or named within one month, the Mining Authority may for the time being appoint a representative, granting him a reasonable remuneration.

NATIONAL FACTORS

There exist no limitations on ownership of corporations by other than Germany nationals.

The following may be remarked on the tax situation:

Usually, in view of the financial requirements, exploration and exploitation of petroleum is done by companies. As mercantile associations, German law recognizes the unlimited partnership, the limited partnership (hereinafter called personal partnerships), the joint stock company, the company with limited liability, and the mining company (hereinafter called stock companies). The stock companies are legal entities. In such case, only the share capital is answerable to the creditors, but not the individual shareholder. The personal partnerships, on the other hand, are associations of natural persons, in which case all associates are personally responsible for the company's debts with the exception of the limited partners in a limited partnership whose liability is restricted to their contributions to the company's capital, one or more partners of the limited partnership, however, being personally liable without any limitation.

GERMANY (WEST)—Oil Consumption
(January to September 1959)

	Metric Tons
LP Gas	337,517
Carbureter fuel	3,453,900
Aviation gasoline	76,484
SBP spirit	50,473
White spirit	88,575
Raw gasoline	149,428
Kerosine	38,689
Jet fuel	31,997
Diesel fuel	3,144,100
Lubricating oil and grease	448,356
Fuel oil	6,887,200
Paraffin (approx.)	36,500
Vaseline (approx.)	3,500
Bitumen	900,113
Petroleum coke	62,743
Refinery gas	128,936
Other products	43,510
Extracts and residues	9,884
Sold to domestic market	15,891,905
Consumed in mineral oil industry	1,051,879*
Bunker oil, all flags	1,349,025
Fuel Oil from Coal and Shale-Oil Processing	
Lignite tar and shale oils	140,163
Hard coal-tar oils	205,461
Internal consumption	15,874

*582,342 tons of fuel oil, 122,206 tons of petroleum coke, and 347,331 tons of refinery gas.

The taxation of companies varies according to their legal character.

When forming stock companies, a company foundation tax of 3% of the capital has to be paid. No such tax is payable when forming personal partnerships.

Stock companies are subject to a corporate income tax amounting to 45% of the company's net profit. Furthermore, the amount distributed as dividends to shareholders is subject to income tax payable by shareholders on a graduated scale. Insofar, therefore, as profit distributions of stock companies are affected, there arises with regard to the distributed profits a double taxation, since profits are first of all subject to corporate income tax, and furthermore to the income tax collected from the shareholders. Under certain conditions, however, the corporate income-tax rate is reduced to 30% with regard to a certain amount of dividends paid to the shareholders.

The personal partnership, as such, is not subject to any corporate income tax. The partners have to pay income tax on their share in the partnership's profit.

There exists in Germany a property tax amounting to 1% of the value of property. In the case of stock companies, the property tax is assessed on their capital. The shareholders have to pay property tax as well on the value of their share. In the case of personal partnerships, there is no property tax payable on the partnership's capital. The partners, however, have to pay property tax on the value of their participation in the partnership's capital. As far as the income tax is concerned, the property tax may be deducted from income. No deduction is, however, allowed from the income of a stock company subject to corporate income tax.

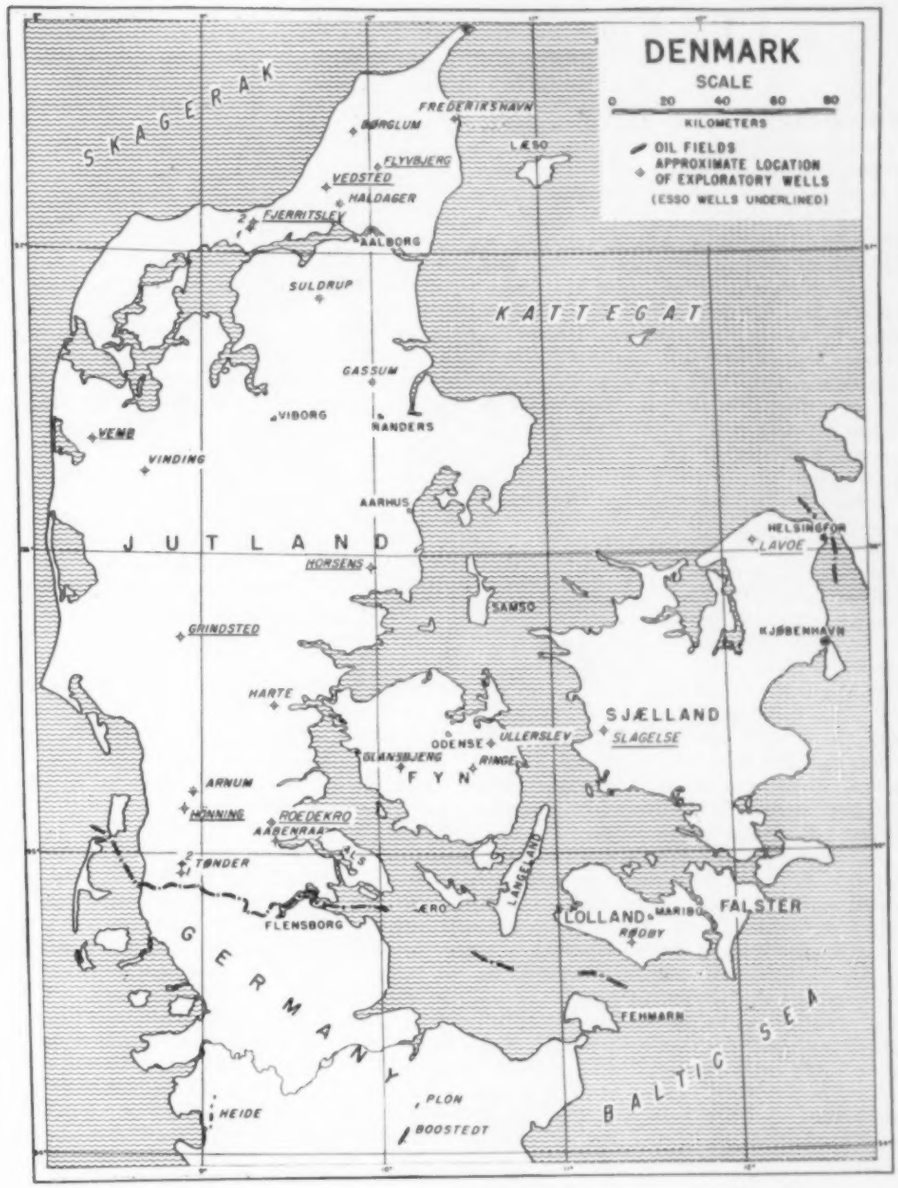
In view of the considerable differences in questions of taxation of the various types of companies and partnerships, it is advisable to consider very carefully the advantages and disadvantages of a certain company or partnership prior to forming same. It is also possible to save taxes by using mixed forms of associations recognized by civil as well as tax law.

DENMARK

EXPLORATION: Danish American Prospecting Co., owned by Standard Oil Co. (New Jersey) has given up its exploration campaign after 11 dry wildcat wells. The company was previously owned by Gulf Oil Corp.; during Gulf's ownership, 17 unsuccessful wells were drilled.

PRODUCTION, REFINING, MARKETING: There is no production of crude oil in the country. Aside from the minor plants mentioned in *WPR 1959*, p. 70, there are no refineries. Tidewater Oil Co. is building a 20,000 b/d plant in the northwest of the country where 100,000-ton tankers can dock at Kalundborg. It will be onstream in 1961.

Denmark's use of oil products was up 14% in 1958 over the year before, reaching a total of 3,972,000 tons. Denmark's per-capita consumption of oil products in 1958 averaged 1,115 liters. This makes Denmark the second largest per-capita user of oil in Europe, and the world's No. 6 oil-consuming country after the United States, Canada, Sweden, Venezuela, and Australia.



OIL LAWS

Applicable oil laws are cited in *WPR 1959*, p. 70. They have been published, along with the concession contract of the Danish American Prospecting Co., in *"Europe—Basic Oil Laws and Concession Contracts."* The volume may be purchased from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

The principal questions facing the oil industry have been the expansion of Russian imports into Denmark and the question of oil storage. A new trade agreement between Denmark and the USSR, covering the period from June 1959 to May 1961, envisages Russian deliveries of petroleum products of altogether 500,000 metric tons during these two years. The agreement stipulates payment for deliveries of oil and all other goods to be made in convertible currencies, whereas earlier Danish-Russian agreements provided for trade on a bilateral basis.

Oil companies are resisting the government's desire for an expansion of Denmark's oil-storage capacity. The government is intent on having additional storage facilities made available for principal oil products, in order that reserves may be held in readiness against any failure of supplies due to critical political situations abroad. The present storage capacity of the oil companies covers six or eight weeks' use of oil products, which is quite sufficient under normal conditions of supply and operation. An expansion of this storage capacity will, according to the companies, saddle them with an investment burden which they are unable to bear under the current profit and taxation conditions.

EIRE

EXPLORATION: The concession contract of Ambassador Oil Corp. has been granted, and preliminary operations are under way by the company. Under the contract, drilling to 5,000 ft must be initiated within two years. The concession covers territorial waters. 25% must be surrendered at the end of five years, and a further 25% each five years thereafter.

REFINING: In mid-April 1959, the 40,000 b/d plant of Irish Refining Co. Ltd. was ready to receive its first cargo of crude at the new jetty, designed to handle tankers up to 65,000 dwt. The refinery includes a pipestill, fractionating tower, powerformer, two hydrofiners (one for gas-diesel oil and the other for treating naphtha prior to feeding it to the powerformer), and a copper-chloride sweetening plant. Irish Refining is owned 40% each by Shell Mex and BP, and Esso, and 20% by California Texas (Caltex).

OIL LAWS

The basic regulation of Eire (Ireland) and the recent concession contract of Ambassador Oil Corp., have been published in translation in *"Europe—Basic Oil Laws and Concession Contracts."* It is available from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

During late 1959 the oil law was passed in its new and revised form. Copies are available through the address for Petroleum Legislation, above.

ITALY

EXPLORATION: In the ENI's exclusive concession over the Po valley, only three minor gas fields were discovered in 1959: Brugherio, Cernusco, and Filamberto. These discoveries increased proved gas reserves to around 90 to 100 billion cubic meters. The percentage of dry holes in this area is becoming very high, 76%.

In the Alpine permits (near the Eastern border) held by ENI, a first wildcat drilled at Bernadia was dry, and prospects are not very encouraging. Better results were had by AGIP mineraria and SOMICEM (two operating companies of ENI) in the Adriatic coastal belt and in the Lucania region. In the Abruzzi, natural gas was discovered at San Salvo, not far from Vasto; while in Lucania the gas field of Ferrandina-Grottole, discovered in 1958, proved important.

Thirty wells were completed in the first 10 months of 1959 between Ferrandina-Grottole and Pomarico; 90% were gas producers. According to ENI, the proved reserves of this field are 12 billion cubic meters, and the flow is calculated at about two million cubic meters per day. The field has a length of over five miles, and is 1.5 miles wide. The pay is 450 ft.

In the first 10 months of 1959, ENI companies drilled in Italy (Sicily included) 231,974 meters, an increase of 12.7% over the corresponding months of 1958. Wells completed totaled 129, against 105 in 1958.

Activity by private concerns on the mainland was less. Petrosud (Montecatini group) continued the development of the Alanno concession, where it has a small oil field. Geophysical and geological work has been conducted in the Marche permits of the same company after the discovery and exploitation of the Cellino gas field, near Teramo, in the Vomano valley. The proved reserves of this gas deposit are estimated at one billion cubic meters.

Another private company, Ausonia Mineraria (Edison associate), carried out geological, geophysical, and gravimetric surveys on-and offshore.

In the south of Italy, Cities Service, jointly with Pan American International Oil, has carried out an exploration survey over the past two years, and in February 1960 is to start drilling. First wildcat will be sited south of Gargano promontory, 55 miles from Bari, 120 from Alanno oil field, and 60 from Ferrandina gas field. Cities Service and Pan American are the first foreign companies to start exploring and drilling activities on the Italian mainland after the approval of the petroleum law of 1957. Their program calls for seven wildcats.

Esso Exploration, in 1959, gave up all its applications to the Ministry of Industry for exploration permits.

In Sardinia geological work has been halted, awaiting approval of the regional Sardinian oil law, passed in late 1959, As regard the other autonomous region of Tretino Alto-Adige, no permits have been requested so far, and no exploration is under way.

The Italian government, which has to approve the new Sardinian law, sent it back to the regional council because Art. 20, imposing on oil producers the construction of a 1.5 million-ton refinery, was held unconstitutional.

ITALY—Crude-Oil Production, 1959

	Metric Tons	% Over Sicily	% Over Mainland	% Over Italy
Sicily (Gulf)	1,400,000	86.42	1,022.90	76.68
Sicily (ENI)	220,000	13.58	160.58	12.52
Total Sicily	1,620,000	100.00	1,182.49	92.20
Mainland*	137,000	8.46	100.00	7.80
Total Italy	1,757,000	108.46	1,282.49	100.00

Natural Gas

Total Italy, 5.9 billion cubic meters (ENI: 5.6 billion).

*Including 58,000 metric tons of natural gasoline.

PRODUCTION: Exact figures for the Italian mainland are available only for the first six months of 1959. In this period liquid hydrocarbons produced on the peninsula amounted to 69,325 metric tons, of which 29,045 were represented by natural gasoline. The more recent figures (seven months) take into account all (Sicily included) Italian hydrocarbon production: 909,703 tons of crude oil and 34,090 tons of natural gasoline.

ENI's overall production (Sicily included) in the first 10 months of 1959 amounted to 307,-819 tons, a very small increase over 1958.

Natural-gas production, in the January-October period, was about 4,652 million cubic meters, an 18% increase compared with the same months of 1958.

REFINING: Processing capacity on the mainland in 1959 totaled 29,285,600 metric tons per year, including the 30% of reserve required by law. At the Ministry of Industry and Commerce are pending applications for new plants or to enlarge existing ones by a further 13,309,-400 tons per year, so that in the future the processing capacity should rise (Sicily included) to over 47.6 million tons. Presently applications for new plants are not being considered by the administration, but the latter will have to make some decision soon, since many refiners need to modernize their plants or to expand them to an economic size.

Crude and residual processed in 1959 is estimated to have risen to over 26 million tons. The yield (11 months) was: gasoline, 14%; jet fuel, 2.4%; kerosine, 1.6%; gas oil, 20.7%; fuel oil, 48%; lubes, 0.6%; asphalt, 2.6%; LPGas, 2.15%; others, 1.65%; losses and consumption, 6.4%. A plan by ENI and Purfina Italiana for a refinery near Rome has been abandoned. Purfina will dismantle its old plant situated in a quarter of Rome, and will build a new one at Ponte Galeria, few miles north of the capital.

The low percentage of light products caused a fall in profits, as demonstrated by the deficit in the refining sector: 50 billion lire in 1958 and about 30 billion in 1959.

At the beginning of 1959, the Condor refinery of Rho was acquired by the Shell group which now owns the Rho plant and the Genoa plant of INPET, and which has an agreement with other minor independent refiners. This trend has been followed by another major company, BP Italiana, which has a similar agreement with the SAROM refinery of Ravenna.

The Italian refining industry is characterized by keen competition between the major companies. Smaller ones survive because they have no network for distribution and they process for the majors.

The petrochemical industry continued its expansion in 1959. The huge fertilizer and synthetic-rubber plant of ANIC at Ravenna was almost completed. Output has been enlarged to

ITALY—Refinery Production
(Metric Tons)

	First 10 Months	1959 (Estimated)
Premium gasoline	626,897	752,000
Regular gasoline	2,588,228	3,105,000
Jet fuel	478,329	574,000
Kerosine	357,896	430,000
Gas oil	4,384,687	5,200,000
Fuel oil	10,653,841	12,700,000
Lubricating oils	146,364	175,000
Solvent naphtha	3,071	3,600
White spirit	26,081	31,000
Bitumen	577,794	700,000
LPGas	500,626	600,000
Others	290,171	350,000
Losses	423,452	510,000
Refinery consumption	890,044	1,070,000
Total	21,745,758	26,200,600

Source: Ministero Industria e Commercio.

70,000 tons per year of GR-S rubber and to one million tons of nitrogenous fertilizers. In Ferrara, Montecatini completed the expansion of its propylene and ethylene units, and is building a plant for formaldehyde at Castellania. A new big plant, the seventh one by Montecatini, is under construction in Brindisi. It should process 1.3 million tons of petroleum to produce 700,000 tons per year of polypropylene, polymers for synthetic fibers, alcohols, solvents, etc.

In the Polesine, i.e., the zone surrounding the Po delta, the small producers of natural gas established a new company called "Methana" with the aim of building a petrochemical plant jointly with German interests.

TRANSPORTATION: The highlight in oil transportation was the starting of work on the Genoa-Aigle-Munich-Stuttgart pipeline. This line will transport annually 13 to 15 million tons (260,000 to 300,000 b/d) of crude and fuel oil. First section (212 miles long, 26-in. pipe) links Genoa with Aigle, in Switzerland, crossing the Alps via tunnel. In the Po valley some secondary branches, amounting to 100 miles of 16-in. pipe, will supply Milan, Turin, and Cremona with a bulk capacity of three to four million tons. Of the total capacity, 10 to 12 million tons will reach Aigle, while "Ste. Raffinerie du Rhone" intends to build a two million-ton refinery. Remaining oil may continue into Germany, through a 138-mile 24-in. line, with a capacity of about 10 million tons per year. From the German border on, the pipeline would divide into two sections, both 18-in., each having four to five million tons of capacity. One branch, 144 miles long, would supply the Munich area; the other, 94 miles long, the Stuttgart area. ENI is the sponsor, with the participation of Ste. Financière Ialo-Suisse and a group of Bavarian government and private interests. The network will have a length of about 690 miles.

An Italo-Austro-German project for a Venice-Austria-Munich line is also being considered by private interests. The plan is still in the preliminary stage.

In Italy, the ENI gas network has reached an overall length of about 4,300 kilometers. Currently ENI is studying a gas line linking the new gas field of Ferrandina (Lucania) with the towns of Bari and Taranto, or with Naples. Transportation capacity should be about two million cubic meters daily.

Montecatini has linked its gas field of Cellino (Teramo), discovered in 1958, by a 25-mile line with its Bussi chemical works.

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SAROM, owner of the Ravenna refinery, plans a pipeline for white products linking Ravenna with Milan. Two intermediate discharging stations are envisaged for Ferrara and Mantua.

At the end of 1959, government authorization was obtained for the new oil port of Genoa. Four piers should permit the simultaneous loading and unloading of seven supertankers. Storage capacity will be expanded. Depth in the harbor will be 16 to 17 meters.

MARKETING: Italy's import-export and consumption developments are shown in accompanying tables. Marketing is characterized by keen competition for new outlets. Smaller companies, the independents, are facing considerable losses.

In 1959, the BP group entered the markets of northern Italy, acquiring 1,500 service stations from two independents, ERG and SAROM 99.

A sizeable rise in 1959 consumption followed abolishment of the surtax of 14 lire per liter which had been levied on gasoline since November 1956, date of the Suez crisis. Its removal was immediately followed by a higher demand for motor fuel.

Taxation on oil-product consumption in the first 10 months of 1959 was over 318 billion lire, against 270.4 billion in the corresponding period of 1958, an increase of 17.6%. Estimates for the whole year are about 380 billion.

In the first six months of 1959, oil consumption as related to other sources of power was as follows (in thousands of coal equivalent):

Coal and lignite	4,759	19.41%
Hydro-geo-electricity	8,211	33.49%
Oil Products	8,466	34.53%
Natural gas	3,080	12.57%

Italian exports went 64% to European countries, followed by Asiatic and African countries with 20%; bunkerage with 13%.

Considerable criticism has been aroused because of slowing down of exploration on the Italian mainland and its increase outside Italy. ENI has now production in Egypt, and is exploring in Morocco, the Sudan, Iran, and Somalia. Recently ENI obtained a promising concession in Libya.

ENI is attempting to penetrate foreign markets. The president, Enrico Mattei, has plans for a refinery in the United Kingdom and a network of filling stations. Similar networks are planned for Austria, Switzerland, Germany, the Sudan, Morocco (where a refinery is planned), Ethiopia, Eritrea, Libya, and Somalia.

ITALY—Oil Exports
(Metric Tons)

	First 10 Months	1959 (Estimated)
Gasoline	1,406,647	1,700,000
Kerosine	252,581	350,000
Gas oil	1,608,301	2,000,000
Fuel oil	3,145,358	3,800,000
Lubes	64,450	80,000
Others	150,465	200,000
Total	6,627,802	8,130,000
Domestic crude	375,218	450,000

ITALY—Refining Capacity
(As of November 10, 1959)
(Metric Tons Per Year)

Plants	Location	Capacity Authorized by Decree (30% of Reserve Included)	Approved Expansion (30% of Reserve Included)	New Expansion Applications
ABCD	Ragusa	250,000	—	—
AGIP	Cortemaggiore	130,000	—	—
AGIP	Gela	165,000	—	—
API	Falconara	1,300,000	2,028,000	—
Aquila	Trieste	1,170,000	1,950,000	—
Condor	Rho	1,820,000	2,470,000	—
Della Piana	Genova	78,000	—	—
DICA	Avenza	455,000	1,170,000	—
Esso Ital.	Trieste	325,000	1,300,000	—
Garrone	Genova	1,495,000	1,950,000	2,990,000
Getty Oil Italiana	Gaeta	390,000	1,300,000	—
ICIP	Mantova	552,500	1,170,000	—
ILSEA	Valmadrera	117,000	390,000	—
INPET	La Spezia	2,000,000	2,730,000	—
IPLOM	Genova	208,000	780,000	—
IROM	Marghera	1,800,000	4,550,000	—
ISLOM	Palermo	450,000[2]	—	—
ITALIA	Cremona	520,000	1,300,000	—
Lombarda Petroli	Villasanta	260,000	637,000	—
Mediterranea	Milazzo	2,600,000[1]	—	—
Mobil Oil	Napoli	3,640,000	5,850,000	—
Nilo	Milano	201,500	520,000	—
Petroli d'Italia	Fiorenzuola	208,000	650,000	—
Purfina	Genova	611,000	—	—
Purfina	Roma	706,000	—	—
Purfina	Milano	286,000	—	—
STOI	Firenze	455,000	845,000	—
RASIOM	Augusta	5,200,000	—	—
ROL	Viguzzolo	65,000	325,000	—
Sanquirico	Genova	195,000	910,000	—
SAROM	Ravenna	1,300,000	3,250,000	5,200,000
SARPOM	Trecate	1,300,000	1,950,000	—
Bianchi Petroli	Cologno Monzese	67,600	—	—
SPI	Fornovo Taro	104,000	650,000	—
STANIC	Livorno	1,950,000	3,900,000	—
STANIC	Bari	1,820,000	4,500,000	—
Volpato	Milano	91,000[2]	520,000	1,300,000
SAICA	Porto Torres	—	—	1,950,000
	TOTAL	34,285,600	47,595,000	

[1] Not yet built. [2] Idle, refinery will be transferred to Talamone (Tuscany). **Note:** If the applications of the 3rd column are approved, the total capacity should rise from 47,595,000 to 53,315,000 metric tons per year.

OIL LAWS

The Italian oil law covering exploration remains unchanged. The draft oil law for offshore exploration is still pending.

In 1959, the autonomous regions of Alto Adige-Trentino and Sardinia approved their regional oil laws. The two laws are not very different from the mainland 1957 law.

According to ENI, the agreement between ENI and SFIS for the building of the Genoa-Aigle-Munich pipeline and the construction of a 40,000 b/d plant at Aigle in Switzerland, has been dissolved. The Italian company Oleodotti Internazionali, in which ENI has 66% and SFIS 33%, will become entirely ENI, and it will construct the pipeline for its own account. In Switzerland, Raffineries du Rhone should become owner of SFIS and build the projected plant for its own account. Reason for the change is not known.

ITALY—Oil Consumption*
(Metric Tons)

	First 11 Months	1959 (Estimated)
Gasoline	2,047,000	2,207,000
Kerosine	263,500	273,500
Jet fuel	192,000	210,000
Gas oil	1,414,500	1,597,000
Fuel oil	8,420,000	9,420,000
Lubricating oils	190,000	206,000
LPGas	594,000	650,000
Bitumen	590,000	620,000
Total	13,711,000	15,183,000

*Bunkerage excluded; amount is estimated at over two million tons.

ITALY—Refined Products Imports
(Metric Tons)

	First 11 Months	1959 (Estimated)
Gasoline	26,330	32,000
Kerosine	140	200
Gas oil	2,275	2,800
Fuel oil	337,191	405,000
Lubricating oils	36,713	45,000
Others	125,382	150,000
Total	528,031	635,000

ITALY—Summary Statistics
Processing by ITALIAN REFINERIES—1959
(Metric Tons)

	First 10 Months	1959 (Estimated)
Foreign crude	20,711,625	25,200,000
Domestic crude	946,886	1,140,000
Foreign residuals	10,013	15,000
Domestic residuals	77,234	90,000
Total	21,745,758	26,445,000

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NETHERLANDS

EXPLORATION: Exploration in the Netherlands has continued actively by the NV Nederlandse Aardolie Maatschappij (NAM), owned 50% by Standard Oil Co. (New Jersey) and 50% by Royal Dutch/Shell group.

All exploration in the Netherlands is relatively recent. The first oil found was at Schoonebeek in 1943. Previous to that time, gravity work had begun as early as 1935, and oil shows had been found by a government geological survey in a shallow well in the south of the country. One of these shows was near Winterswijk in the eastern part. All of them were in the Carboniferous.

The Netherlands possesses one mainly gas-bearing Permian basin in the northeastern part of the country and two Jurassic-Lower Cretaceous basins which are mainly oil-bearing; the most easterly of these constitutes in reality a westward extension of the adjoining Hanoverian basin, and the most westerly represents the coastal penetration of a basin covering part of the North Sea shelf.

In the Permian basin, 10 gas-bearing structures have been found, while five structures were condemned besides two unproductive salt domes (Schoonlo, Winschoten). The latter two are an important find, as they gave rise to the erection of a salt and soda works at Delfzijl.

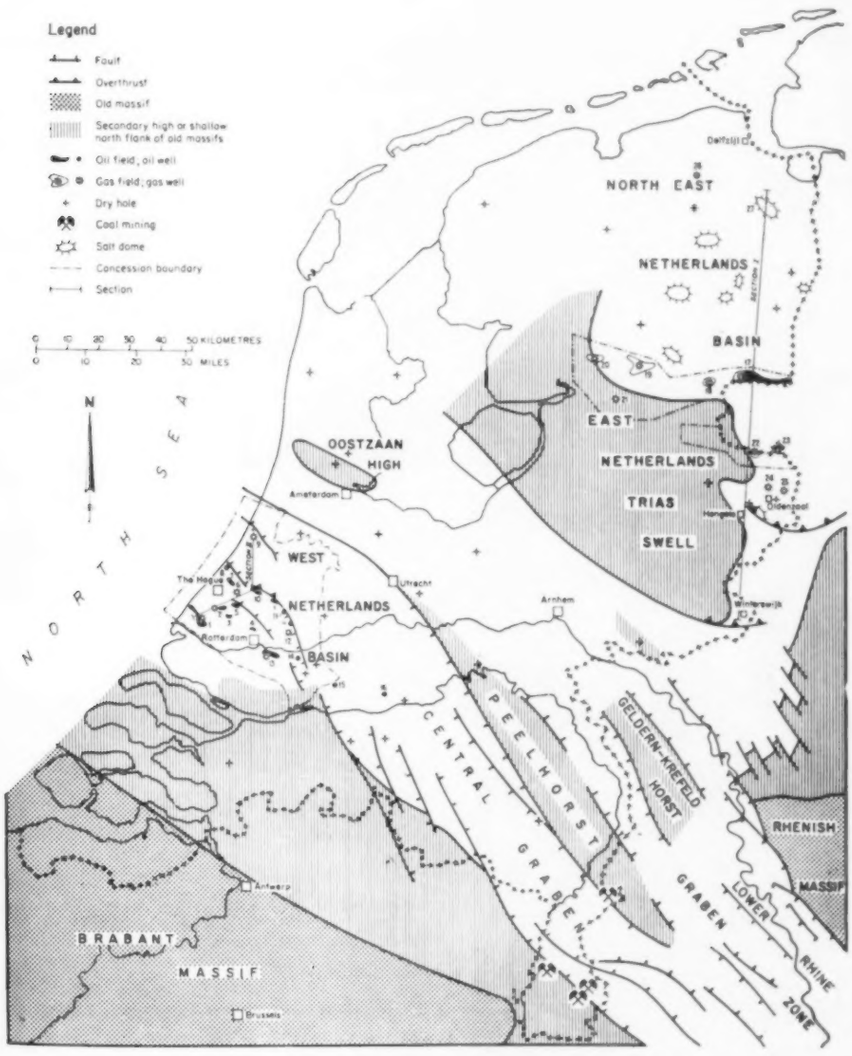
In the western Cretaceous basin eight oil-bearing structures were found, and four yield gas as well as oil, while up to now three structures have been found to contain gas only. There are six nonproductive structures.

In the west, the best prospects were encountered southeast of Rotterdam (IJsselmonde-Ridderkerk anticline) and along the northern boundary of The Hague.

The government passed an act in 1933, allowing BPM (Shell group) an exclusive search for oil and gas. Between 1935 and 1947 the drilling of exploration wells was limited to about 60 relatively shallow reconnaissance wells; afterwards a large number of wildcats with depths ranging between 7,000 ft and 12,000 ft were drilled with the aid of modern tools which came into use in 1948. This resumption of active search for oil and gas coincided with the formation of the Nederlandse Aardolite Maatschappij (Netherlands Petroleum Co.) in which the Royal Dutch/Shell and Standard Oil (New Jersey) each took a 50% interest. Concessions were applied for as soon as economic production was proved, in conformity with the mining act. The crown granted three such concessions in the east, and one covers part of the province of Holland in the west. All three together have a surface area of more than 1,000 square miles.

A traditional rate of two discoveries per year was continued through 1958, with two small fields found at Werkendam and Meyendel. They were in the Middle Jurassic and Lower Cretaceous, respectively. For exploration history, given briefly, see *WPR 1957* (p. 203) and *WPR 1958* (p. 208). No discoveries were reported during 1959. NAM recently began a seismic survey offshore the southern part of The Netherlands, in the North Sea.

For an exceptionally complete review of oil exploration and production in The Netherlands, see *World Petroleum*, June 1959, edition (Vol. 11) Holland section.



PRODUCTION: During 1958 production rose to 30,925 b/d, and during 1959 to 31,500 b/d. Approximately two-thirds of this amount was produced by Schoonebeek and one-third by 11 scattered producing fields in the west, five of which until now have been just "one-" and "three-well" fields. By the end of 1958, the share of western Netherlands had already risen to 40% of the then-developed daily production of 35,000 bbl, thereby compensating for the drop of the Schoonebeek field, where production had gradually declined to 21,000 b/d from its peak of 26,000 b/d in 1957.

The bulk of the Schoonebeek production is produced by pumping; this is necessary because the reservoir pressure is slightly below the hydrostatic and, therefore, too low to lift the present volume of 95,000 bbl of salt-formation water per day together with the oil, the more so as the gas fluid ratio is low (about 10 or 45 cu ft per bbl). Due to the fact that the water drive is intensive on the flanks but part of the western crestal area is producing under depletion conditions, the wells vary considerably between 10 b/d and 650 b/d of clean oil. In the western Netherlands most of the oil production is still flowing, and so far the majority of the fields seem to produce under strong and almost ideal water-drive conditions.

Paraffinic crude constitute the bulk of present Dutch production, because Schoonebeek crude (60%) is highly paraffinic. In the western Netherlands paraffinic crudes occur next to asphaltic crude in all horizons, but geographically paraffinic crudes are restricted to structures lying in the deeper part of the basin. The lightest crude has been found in the youngest formation, the Albian, from which small samples of a 37 API crude with a poor point of +3 C have been extracted.

At Schoonebeek, in eastern Netherlands, the crude contains 6% to 7% paraffin near the edge of the German-Dutch basin, and migration seems not to have altered its chemical nature except that the crude undoubtedly is weathered with a resulting gravity of 25 API. In western Netherlands, however, crudes tend to became asphaltic near the edge of the basin in all horizons, apart from progressive loss of light constituents.

Two different types of crude are being produced in the west, one with pour points between

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+5 C and 25 C and API gravities ranging between 36.5 and 27.5, and the other with pour points between —17 C and — 5 C and gravities varying between 19.5 and 14 API.

A number of dry gas fields in both the east and the west have been put into production. Most of these gas fields produce from Permian dolomites which, especially after acidizing, yield high potentials, the more so as formation pressures are mostly high (up to 4,400 psi.) To this type of field belong Coevorden, which was the first to be discovered in 1948; Tubbergen, Denekamp, Rossum, and De Lutte; also Ten Boer in the north; and, finally, Schooenbeek itself. Some other fields produce gas of undoubtedly Permian origin which migrated into higher layers of various age. De Wijk, Staphorst, and Wanneperveen are of this type.

NAM is committed to offer any gas not needed for its own operations to the State Gas Service which has asked for guaranteed mean daily quantities to be produced over a period of 20 years. The offer, made about 1953, foresaw an aggregate delivery of 100,000 million cubic feet in 20 years. In 1958, this offer was increased to 194,000 million cubic feet over the same period. NAM discovered dry-gas reserves in excess of its needs in the Albian sandy formations of De Lier field in the west. The drilling of gas wells is now being carried out there, and 30,000 million cubic feet was recently offered over the next 20 years to the same State body.

All Dutch crudes are sweet, as is most of the gas derived from sandy formations. Only the gas produced from dolomites contains quantities of H_2S and mercaptans. The purification of this gas is the responsibility of the State Gas Service. Sweet crude is a premium crude, and comes in handy in a country which is largely dependent on imported sulfur-bearing crudes.

TRANSPORTATION: The Rhine Pipeline Co. (NV Rotterdam-Rijn Pijpleiding Mij.) was established in 1958 to lay and operate a pipeline carrying crude oil 180 miles from Rotterdam to the Rhine-Ruhr area, West Germany's main industrial area, where the crude will be processed in refineries for local consumption. The 24-in. line will run 96 miles from Rotterdam (Pernis) to Venlo near the Dutch border. One section of 56 miles will run to Godorf near Cologne, where a Deutsche Shell refinery is being built, and then on four miles to Wesseling to the Caltex-Tankkraft; while the other branch will go 25 miles to Wesel to connect with an existing pipeline to the Gelsenberg Benzin refinery. Work will be completed by the middle of 1960. Initially about 130,000 b/d of crude will be pumped from Rotterdam to the Rhine-Ruhr area. Maximum economic throughput will eventually rise to 400,000 b/d.

Shares in the NV Rotterdam-Rijn Pijpleiding Maatschappij are held by NV De Bataafsche Petroleum Maatschappij, The Hague (40%), by Gelsenberg & Mobile Oil Handles und Transport Gesellschaft, Hamburg (40%), and California Texas Oil Corp. (Caltex), New York (20%). The total cost of the project will be the equivalent of about $35.5 million.

Caltex, late in 1959, began work on a large crude terminal and a pipeline to tie into the Rotterdam-Rhine crude pipeline system. The terminal will be completed early in 1962, and eventually will accommodoate tankers up to 100,000 dwt.

THE NETHERLANDS—Fuel Consumption and Production
(Millions of Tons of Coal-Equivalent)

	1937	1955	1975
Consumption	15.5	26.0	43.0
Coal production	14.4	12.0	12.0
Oil and natural-gas production	—	1.7	2.1
Coverage of consumption by own production	93%	53%	33%

(Bunker oil and coal are not included in these figures.)

Tankers: The Netherlands stands seventh on the list of the world's mercantile marine, with a total of over 4½ million tons of ocean-going shipping. Of this total, about 27% is made up of tankers, making the Dutch fleet number eight on the international tanker list.

At the beginning of 1959, tanker tonnage under the Dutch flag (vessels over 2,000 dwt) comprised 122 vessels of 1,769,000 dwt. Of these, 90 vessels totalling 1,184,000 tons were owned by oil companies: 64 by Shell (853,000 dwt), 11 by Caltex (196,000 dwt), 4 by Esso (76,670 dwt), and 11 by other oil companies. The remaining 32 tankers were owned by independent shipping companies.

The tanker fleet of the oil companies included six supertankers each of 26,000 tons or more, of which two were owned by Shell, three by Caltex, and one by Esso.

At the beginning of 1959, the Dutch oil companies had 20 new tankers under construction or on order, of which Shell had 11 totaling 343,000 dwt), including seven supertankers. Caltex had four (totaling 154,000 dwt, all supertankers), as had Esso three (totaling 144,000 dwt), and other oil companies two (totaling 90,000 dwt). This makes a total of 731,000 dwt to be added to the oil companies' tanker fleets in the future, including not less than 16 supertankers which will account for 90% of this total new addition.

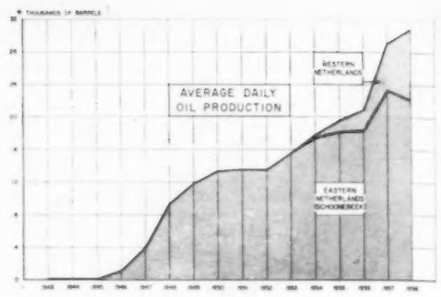
As independent shipping companies will be adding seven more tankers, totaling 175,000 dwt (including two supertankers), the tanker fleet will grow to 27 vessels representing about 900,000 tons, three-quarters of which will be incorported in 18 supertankers.

REFINING: Concentrated around Rotterdam there is a refinery complex of 360,000 b/d capacity, which in 1960 will have increased to more than 450,000 b/d.

The two refineries in operation are Royal Dutch/Shell, 300,000 b/d; and Caltex, 60,000 b/d. At both, tankers up to 47,000 dwt can berth at the refinery sites. A third refinery is under construction at Rotterdam by Esso Nederland NV. To come onstream in 1960, it will have an initial capacity of 95,000 b/d.

Continental Carbon Co. is to construct a carbon-black plant in 1960 at Rotterdam, with initial annual capacity of 15,000 tons of high-abrasive carbon black. Continental Carbon is owned by Continental Oil Co., Houston; The Shamrock Oil and Gas Corp., Amarillo, Texas; and Witco Chemical Co., New York. It will own 50% of a carbon-black installation been built in France in 1959.

MARKETING: Energy requirements of the Netherlands are covered about two-thirds by solid fuels and one-third by oil. Among the factors which contributed to the expected rapid increase in oil use is the growing population, estimated to increase by 14% in the coming seven



years. Intensive industrialization increased the relative use of oil by industry to over 45% during 1959. Consumption by industry jumped to 17 million in 1957, amounting to about one-half the total home demand for petroleum products.

The mechanization of agriculture and horticulture is reflected in sales of fuels for tractive power. The proportion of mechanical traction has doubled in the past seven years, to 47% from 23%. The use of diesel engines expanded markedly in the postwar period, while that of liquefied petroleum gases is rapidly increasing. A very important factor is ocean-going shipping, accounting for the supply of over 14 million barrels of bunkering oil in The Netherlands every year.

In the domestic sector, the use of petroleum products opened up various new markets, including the use of oil for heating. According to official estimates, the use of liquid fuels for domestic power and heating may rise from the present 14% of total domestic power consumption to 36% within the next 20 years, while the use of solid fuels in this field may fall to 37% from the former 70%.

There are three large marketing companies—Shell, Esso, and Caltex—and several smaller sellers such as BP, Purfina, and Gulf. Supplies are concentrated in the two principal ports of Rotterdam and Amsterdam, and then distributed to the inland market either directly to customers (from the refineries) or through intermediate storage points.

Large barges are used to convey products in bulk to depots and, wherever possible, directly to customers. In certain cases, deliveries are made by barges to the nearest location completing the delivery with bulk lorries to the customer.

It is hoped the economic integration aimed at by the European Common Market may give a further stimulus to the Dutch economy, which will make itself felt in a still greater demand for oil. Marketing companies are generally hopeful about the future.

OIL LAWS

No changes occurred in oil regulation during 1959. For a summary of the oil law, see

THE NETHERLANDS—Oil Consumption, 1957
(Excluding Chemicals and Town Gas)

	Millions of Barrels
Gasolines	8.5
Illuminating kerosine	2.1
Black oils	
Traction	5.9
Heating	
Industry	17.0
Lubricants	0.8
Bitumen	0.9
Aviation products	1.7
Liquefied gases	1.2
Total	38.1

WPR 1957 and *1958*. The text of The Netherlands oil law has been published in: "*Europe—Basic Oil Law and Concession Contracts*," available by writing to *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

The following résumé of oil legislation in The Netherlands has been prepared by *World Petroleum Report* and checked by C. F. Driessen, Carel van Bylandtlaan, 30, The Hague.

Oil exploration and development in The Netherlands are governed by the old Napoleonic law of April 21, 1810, designated as "Loi du 21 Avril 1810 concernant les Mines, les Minieres, et les Carrieres."

The law is a very general one. It imposes no restrictions on exploration, except permission from the surface owner. In the event the owner refuses such permission, authorization may be obtained from the government, which overrules the owner of the land.

Exploitation of subsoil minerals[1] may take place only under a concession which is granted by royal decree. An exploitation concession cannot be granted unless the presence of oil in useful[2] quantities has been shown. Between discovery and the granting of concession, a temporary permit for disposing of production may be obtained known as a "permis de vente."

All applicants for concessions must prove they possess adequate financial resources and technical knowledge. There is no limitation on foreign ownership of concessions.

The concession decree confers the perpetual[3] ownership of the "mine" upon the concessionaire. There are no specified limits to the size of the area which may be obtained.

There are no specified obligations for drilling, nor other work, imposed on the concessionaire. However, if he does not work the concession and is not active after notification by the government, after a term of one year the concession may be cancelled and later granted to any third party.

Financial obligations of the concessionaire include compensatory payments to the landowner. These are not specified in the law, but are to be contained in the concession text when the concession is granted. In concessions granted to date, the amounts have been either 0.50 florins per hectare yearly or a lump sum payment of 12.50 florins per hectare. There is no fixed rental payable to the government.

In the event the landowner does not voluntarily permit occupation of his land for purposes of exploitation, the law gives the concessionaire the right to occupy same—after payment of the compensation specified above. The landowner may demand yearly payment equal to twice "produit net" of his land—which, presumably, would mean twice the expected net earnings from agriculture or other purposes for which the land had been used; otherwise the landowner can demand that the concessionaire buy the land at a price to be fixed by the courts.

It has been government practice to include in the concession deed several obligations which are not contained in the law. These include the obligation to furnish reports on production and other activities; a clause to the effect that the 1939 regulations concerning safety are to be observed; specifications on demarkation of concession limits, and similar obligations.

Royalty payments are not required by the Law. However, the government and the oil operators have concluded a contract providing for a special "benefit" to the government which amounts to 10% of the net profits earned by the company, with a minimum of one florin per gross metric ton of water-free crude. Net profits are defined precisely by subtraction from gross profits (plus interest obtained on the reserve fund) of: (1) all taxes and other changes imposed by the law; (2) all costs of exploration and exploitation, depreciation, yearly payments into the statutory reserve fund of the company (which is limited to 10% of net profits); (3) all other expenditures chargeable to profit-and-loss account, in accordance with sound business practice.

The concessionaire is subject to all general taxes of the country as well. The principal one of these is the tax on profits of a limited liability company—which varies between 43% and 47%. Taxable income is calculated on nearly the same basis as for the government's 10% "benefit," taking into account, however, that this benefit itself is deductible for calculation of profits. Two incentives are provided for in the calculation of the taxable profits. These include accelerated depreciation of fixed assets amounting to one-third of the purchase price, and an investment allowance which is grantable over and above depreciation. For the time being, this allowance has been suspended.

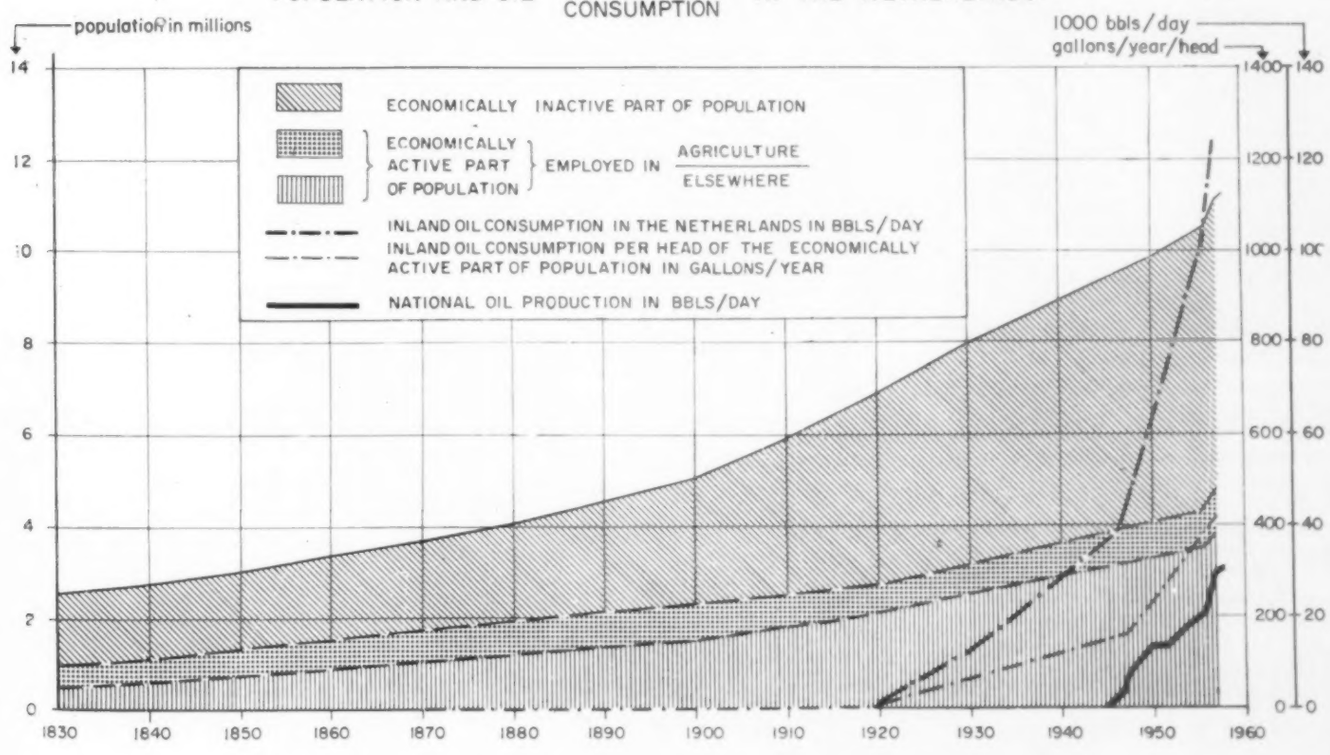
The aggregate of the government "take" amounts to nearly 50% of the oil company's profits.

[1]Netherlands Mining Law does not state to whom subsoil minerals belong *before* a concession is granted. It clearly states the ownership of minerals *after* a concession is granted, however.

[2]According to the law an "exploration utile" must be certified.

[3]According to the law, the concessionaire gets the "perpetual ownership of the mine" (which is defined as "the masses of mineral substances or fossils contained in the earth's bosom or existing at the surface and known to contain in veins, layers, or accumulations gold, silver, etc. . . . bitumens . . . etc.").

POPULATION AND OIL $\frac{\text{PRODUCTION}}{\text{CONSUMPTION}}$ IN THE NETHERLANDS



BELGIUM

EXPLORATION: No concessions for gas or oil are known to exist in Belgium, although parts of the country have stratigraphic conditions favorable to oil occurrence. No exploration was done during 1959.

Royal Dutch/Shell has applied for exploration license on 649,610 acres in southern Belgium. Acreage is in southern Hainaut province, central Namur, western Liege, and Luxembourg province.

PRODUCTION, REFINING, MARKETING: There is no production of oil, although considerable refining is done. For a breakdown of ownership, capacities, and location, see *WPR 1959*, p. 68.

Annual consumption of oil products is now about eight million tons (160,000 b/d).

The percentage of petroleum products in national energy consumption increased to 20.8% in 1957 from 6.9% in 1948. This increase is noted especially in the use of gas oil and fuel oils, which doubled between 1951 and 1957, whereas gasoline consumption has increased by 43%. In final net energy consumption in 1957, petroleum products were 22.3% of the total. Of the fuel required for home heating, 11.4% was supplied by liquid fuel and 1.7% by liquefied gases. Gas oil and fuel oil supplied 13.7% and liquefied gases 0.7% of industrial energy requirements.

OIL LAWS

No changes are known to have occurred in legislation governing oil, as cited in *WPR 1959*, p. 68. The texts of oil laws, in original French and Flemish and in English translation, have been published and may be obtained from *Petroleum Legislation Ltd., P. O. Box 1591, Grand Central Station, New York 17, N. Y.*

NATIONAL FACTORS

No change has occurred in the various national factors as listed in *WPR 1959*, p. 68. Income taxation is still listed therein, with a maximum rate of 40%.

Two bills being considered by the parliament will aid industries, including oil, to adjust to the new European Common Market. The principal provisions of the "general bill" would cut interest rates on loans by 2 to 4 percentage points from the present average of about 5¾%. The government would permit qualified companies to accelerate amortization of their investments or, in some cases, to amortize 10% more than their original investment.

SWITZERLAND

EXPLORATION: Exploration has been slowed by the requirements for 75% Swiss participation in exploratory ventures and lack of legal clarification. Standard Oil Co. (New Jersey) dissolved, early in 1959, its understanding with a Swiss group for the expenditure of about $5 million on exploration (see *WPR 1959*, p. 100) because the expected clarification on Berne's mining law and the federal government's oil law did not materialize. Neither did the expected concordat between Berne, Soleure and Lucerne cantons.

The most active exploring company was SEAG (Schweizerische Erdoel AG), owned 25% by the German company, Elwerath, also the operator. The company continued its work in the north (see the concession map in *WPR 1959*, p. 100); and its Swiss participants formed Swisspetrol Holding AG, with one million Swiss francs capital, to help finance exploration by Swiss companies. SEAG expects to drill several wells in its area, beginning early in 1960.

The Ste. Anonyme des Hydrocarbures in Lausanne, has drilled one dry wildcat well (see map) at Chapelle (known as the Moudon well) to 1,530.8 meters. The company is now doing seismic work.

The federal government, which has reserved to itself the right to cancel any concession "endangering national security," has been asked to cancel the concession granted in Fribourg canton to a local company which intends to farm it out to D'Arcy Exploration, a British Petroleum Co. subsidiary.

REFINING AND TRANSPORTATION: Switzerland's first large oil refinery, 40,000 b/d, will be built at Aigle under an agreement between Soc. Financière Italo-Suisse and ENI, the Italian government's company. A local company, Soc. des Raffineries du Rhone SA, has been set up at Lausanne, owned 2/3 by Soc. Financière Italo-Suisse and 1/3 by ENI. These ownership proportions are reversed in a pipeline company recently set up in Italy to complete in about three years a 28-in. pipeline from Genoa in Italy to Aigle in Switzerland. Capacity will be 200,000 b/d, including 16-in. to 20-in. branches from Genoa to Milan, Turin, and Piacenza in Italy. It may eventually be extended into Germany.

MARKETING: A brisk competitive struggle is going on for the Swiss market, the fastest growing in Europe. Consumption rose 80% from 1954 through 1958, and about 15% in 1958. Contrary to the trend in other European countries, motor gasoline has risen almost the same as black oils, showing a 77% rise during 1954-58. This product accounts for about ¼ of total consumption. Black products account for about 2/3 of the total market.

SWITZERLAND—Consumption of Oil Products
(Thousands of Metric Tons)

	1954	1955	1956	1957	1958	% Increase 1954-58
Motor gasoline	452	525	636	654	800	77
Gas-diesel oils	821	971	1,319	1,338	1,500	82
Fuel oil	282	333	472	498	600	113
Other products	201	221	256	290(a)	300	50
Total	1,756	2,050	2,683	2,780	3,200	82
% increase over preceding year	18.7	16.4	30.9	3.6	15.1	

(a) Including aviation fuels, 60; kerosine, 40; lubricants, 45; bitumen, 82, etc.
Source: 1954-57, OEEC; 1958 estimated.

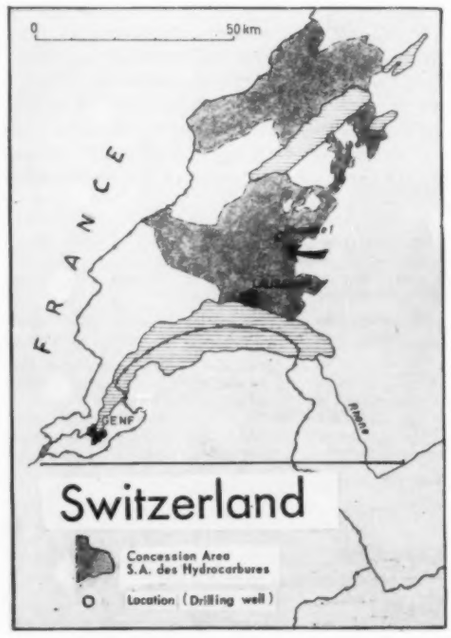
BP, Esso, and Shell are the largest suppliers, and cover more than 60% of all inland trade. But in addition to these, and concerns such as Gulf, Caltex, Petrofina, and CFP, there are numerous small importers who offer lower prices, facilitated by low-priced products in neighboring countries, notably in Italy. Migrol, oil affiliate of Herr Duttweiler's trading organization Migros, with about a 2% share in the total Swiss petroleum products market, has been the spearhead of price-cutting competition, especially in gasoline.

OIL LAWS

Oil legislation is the exclusive competence of the cantons, and they have rejected all federal attempts to assume responsibility for oil, including the circular letter of 1958 (see *WPR 1959*, p. 101). The Central Swiss Oil Concordat has also foundered on the rock of 75% Swiss participation, and it looks as though the three cantons of Lucerne, Berne, and Soleure will go their separate ways. For details on Swiss legislation, see *WPR 1957*.

Reportedly, a federal constitutional revision is being drafted which will enable the federal government to legislate in petroleum affairs. It is expected, however, that the cantons will reject it and continue to hold their authority over oil and mining rights.

On September 24, 1955, Zürich, Saint Gall,



Argovie, and Thurgovie made an intercantonal agreement for oil exploration and development, requiring each to grant identical exploration and development concessions to concession holders 75% Swiss. They granted a concession over all their territories to SEAG in November 1956.

A regulation of early 1959 provides that crude oil imported for refining in Switzerland must pay a customs duty of 16 Swiss francs per 100 kilograms as "petroleum products for engines." If the crude is imported under customs supervision and refined in Switzerland, the resulting products become subject to the same duty rate, 16 Swiss francs per 100 kilograms. The aim is to assure importers of products equal tariff treatment in the event a refinery should be built in Switzerland.

NATIONAL FACTORS

The national factors affecting investment are covered in previous issues of *World Petroleum Report*, viz., *1957*, *1958*, and *1959*, and are not restated here. They include monetary and political stability, convertibility, and many favorable features. The government requirement for 75% ownership of exploring companies has, however, so far prevented participation by larger international companies.

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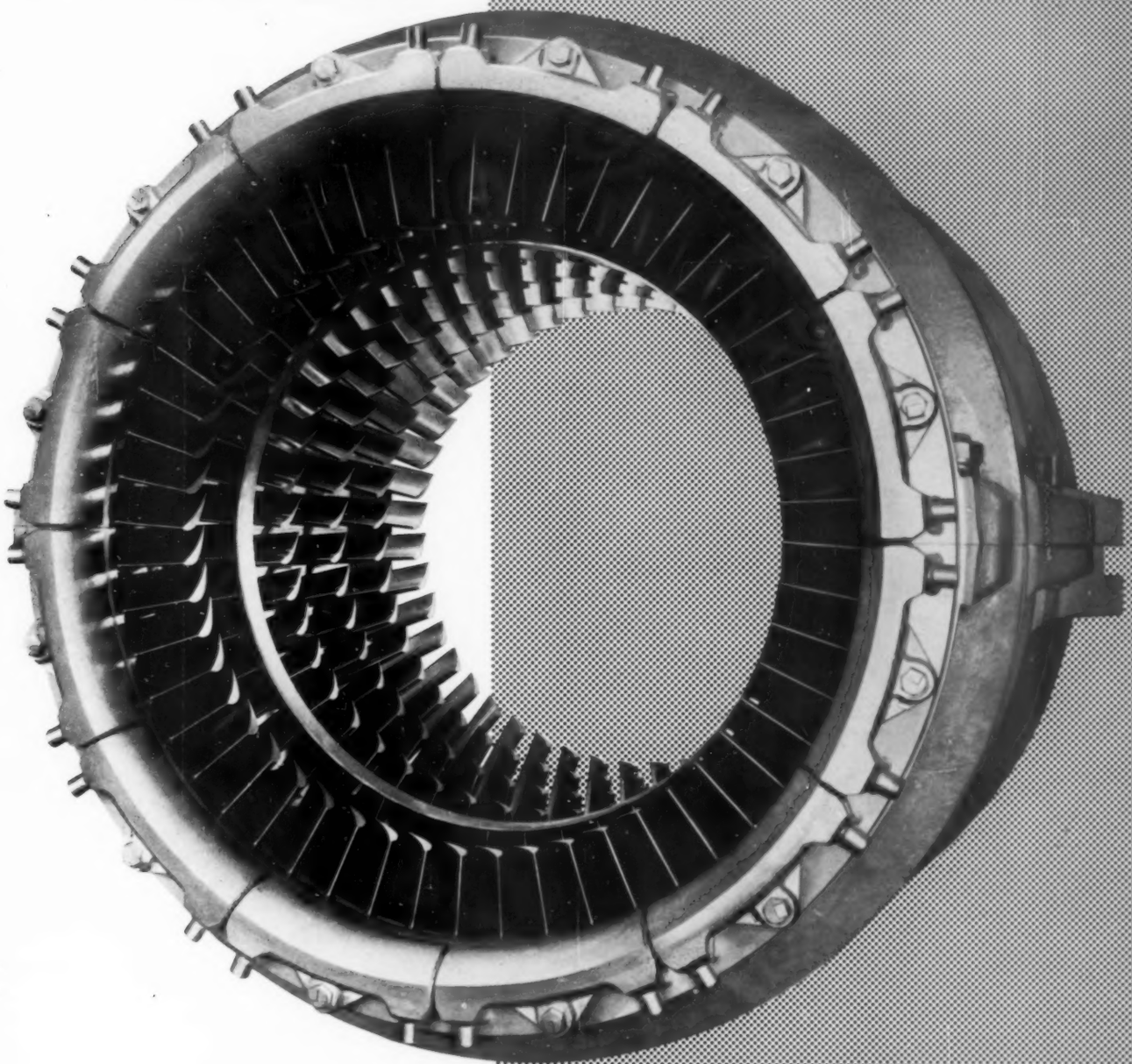

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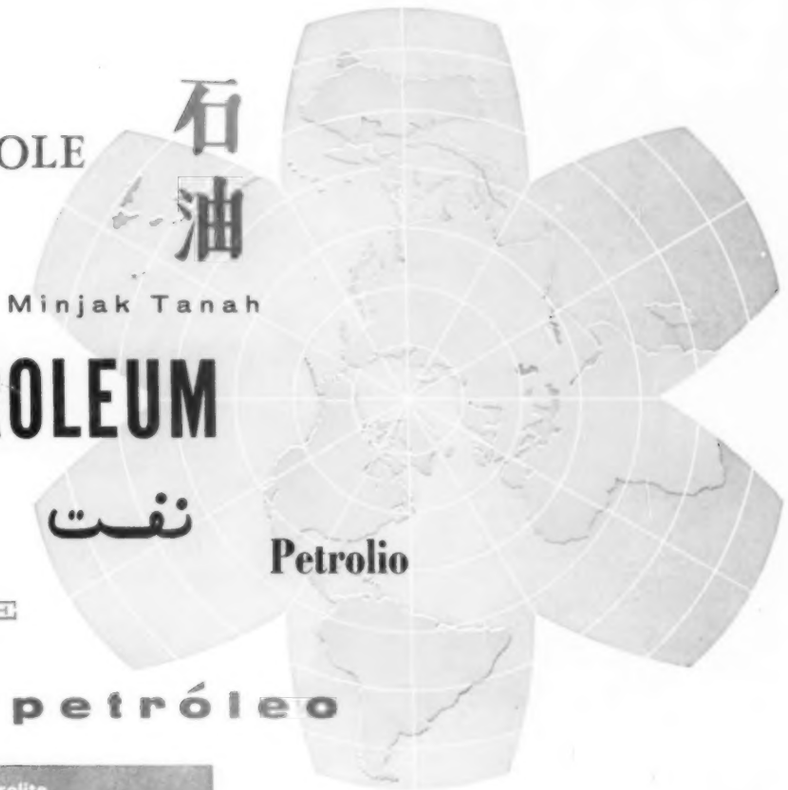

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